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Identifying Possibilities and Building Networks for Renewable Energy in Nigeria, Kenya and South Africa: Connect Project Experiences

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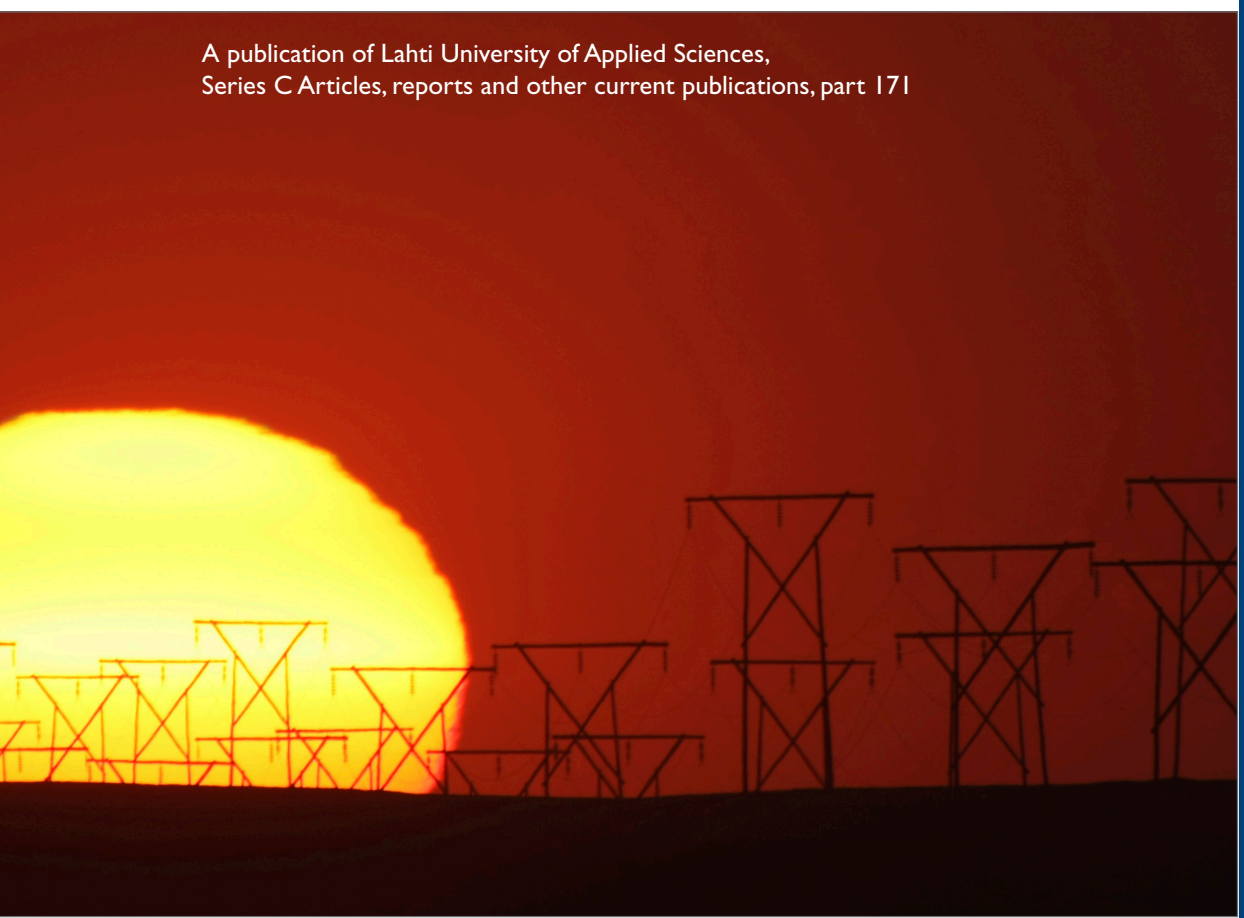

Maarit Virtanen (ed.)

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Introduction

Maarit Virtanen, Lahti University of Applied Sciences

Africa is stated to be the last economic growth frontier in the world. Africa is both developing fast and having great development needs. Identified megatrends in Africa include urbanisation: the largely uncontrolled growth of mega cities, mega regions and also mega slums. For example, Lagos contributed about 25% to the Nigerian GDP in 2014, the city population grows by 8 % annually, while 75% of Lagos population is expected to live in informal settlements by 2030. There are huge infrastructure needs in cities, and massive projects are being implemented. Energy is another megatrend with urgent need for sustainable energy solutions. Lack of energy is an obstacle for growth and development of well-being. (James, M. 2014).

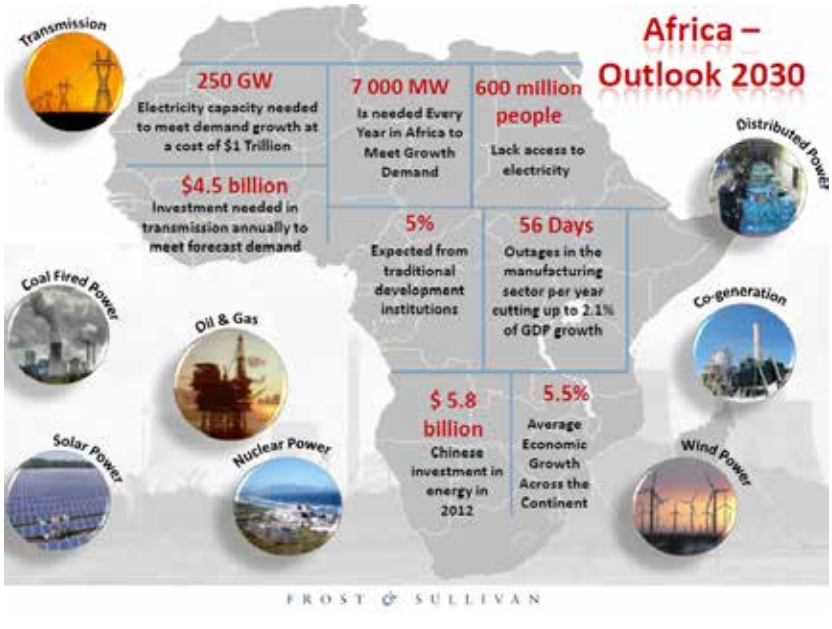


Figure 1. Energy outlook in Africa (James, M. 2014).

Finnish companies have technologies and solutions that can really make a difference; but solutions must be adapted to fit local needs and conditions. For Finnish companies a key issue is to find reliable, long-term partners in target countries and regions.

This publication presents some of the findings on creating and modelling networks to developing renewable energy markets during the Connect project. The project is implemented by the Federation of Universities of Applied Sciences (FUAS), the alliance between Lahti University of Applied Sciences (Lahti UAS), Laurea University of Applied Sciences (Laurea) and HAMK

University of Applied Sciences (HAMK) during 2012-2014. The project is funded by Tekes – The Finnish Funding Agency for Innovation.

One of the main objectives of Connect project is network creation and modelling that has been tested through collaboration with universities, ministries, companies, NGOs and other organisations in target countries, in addition to active participation of Finnish companies and FUAS international students as intermediaries between Finland and their home countries. The international and Finnish students have done various studies, project works and Bachelor's and Master's Thesis during the project on renewable energy opportunities. The main work has focused on Nigeria, Kenya and South Africa.

Figure 2. Street view in Lagos, Nigeria (photo Maarit Virtanen 2014).

In Nigeria, the results achieved during the project include establishment of good cooperation with Ebonyi State University (EBSU) and beginning of collaboration with Lagos State Ministry of Environment and Lagos State University. FUAS and EBSU organised jointly two workshops in Abakaliki, Ebonyi State with wide representation from the university, and public and private organisations from the region. The discussions have continued after the workshop on cooperation between EBSU, Ebonyi State Environmental Protection Agency and Finnish actors on waste management. Project cooperation with Innerwheel Nigeria contributed to establishment of a solar PV solution for Idembia Health Centre in Ebonyi State. Rice husk produced at Ebonyi State was also tested by the Connect project for biogas production and pelleting.

In Lagos, the project organised also two workshops with good participation from various organisations and positive feedback. The workshops helped to identify specific needs and challenges, as well as market opportunities, and in

addition brought for the first time together many of local actors to discuss issues and to begin cooperation. One of project personnel was also invited as a speaker to Lagos State Climate Change Conference as a result of cooperation.

In Kenya, the Connect project has cooperated actively with Kenyatta University's Chandaria Innovation Centre that has conducted research on solar, wind, biogas and hybrid solutions for the project. Finnish students have collaborated with Chandaria for 'intelligent matching' of technologies, services and market niches. A student and alumni cooperative was established at HAMK University of Applied Sciences to continue the work. A Finnish NGO, Shalin, has also been involved in activities in Kenya. Cooperation with Chandaria has enabled connections to county governments and real estate developers. Real estate development at gated communities and projects with county governments have been identified as niche markets in Kenya. Already during the Connect project, three direct company-to-company contacts have led to negotiation phase. Cooperation has also begun with Strathmore University Climate Innovation Centre.

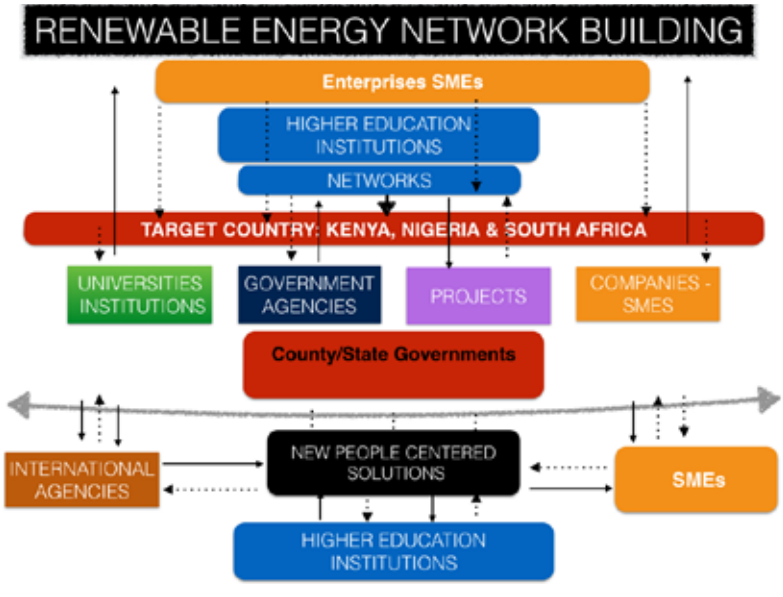


Figure 3. Example of networking modelling in Connect project (Peter Kuria 2014).

In South Africa, the project has focused on possibilities of university cooperation. Collaboration opportunities have been discussed with altogether six universities that have also been visited during the project. Lahti UAS has a student exchange programme with the North West University, and during the project it has been agreed to broaden the scope of cooperation to research on waste to wealth opportunities. Waste to wealth was identified as one of areas with large needs and market potential, and it is also a central topic in City of Lahti's municipal cooperation with Rustenburg and Madibeng municipalities in South Africa. North West University's exchange students have also done three project works for the project while studying in Finland.

Figure 4. North West University exchange students Allezayne Nieuwenhoudt ja Keneilwe Phora presenting their project work in Lahti, Finland (photo Päivi Kärnä 2014).

The Nelson Mandela Metropolitan University (NMMU) has also showed strong interest in cooperation. Ronelle Potgieter from NMMU visited Finland in spring 2014 to visit Finnish companies and to participate in Connect project seminar. In autumn 2014, two members of Connect team had also a chance to visit both NMMU and NWU on a project preparation trip to continue the work began in the Connect project and to strengthen the networks with universities, municipalities and other organisations.

Overall, the Connect project has proved that there is interest to network with Finnish actors to co-create needed solutions. A challenge in the project has been to encourage Finnish companies to actively participate in networking. The opportunities in developing markets must be opened up more to encourage companies to approach markets. Besides general information on country opportunities, more specific information is needed on market niches and conditions at different areas also within a country.

Long-term cooperation between universities could be one part of identifying opportunities, networking with different stakeholders and co-creating solutions. International students studying in Finland are a great asset, but also they need training to be able to act as intermediaries. We hope that the good cooperation began during the Connect project with different organisations will continue through new projects, and also through student and teacher exchange. Warm thanks to all authors and especially for our southern partners; Professor Johnny Ogunji from Ebonyi State University; Ronelle Potgieter from Nelson Mandela Metropolitan University; and Johnson Gituma and Anthony Kinyanjui from Kenyatta University.

Reference

James, M. 2014. Megatrends Driving Mega Opportunities in Sub-Saharan Africa. Presentation at Tekes Business with Impact Workshop, 10 September 2014 [referenced 6 November 2014]. Available at: https://tapahtumat.tekes.fi/uploads/389bc508/Mani_James-5412.pdf

Nigeria – Collaboration towards Sustainable Business Networks

Maarit Virtanen, Lahti University of Applied Sciences; Ritva Jäättelä, Laurea University of Applied Sciences and Johnny Ogunji, Ebonyi State University

Nigeria is an emerging market with expanding financial, service, communications, technology, manufacturing and entertainment sectors. After a statistical reassessment of national accounts data (GDP rebasing), the Nigerian economy is stated to be the largest one in Africa. The economy is also becoming more diversified and complex, although it still relies strongly on the oil sector. (The World Bank 2014, 2-12). Since 2007, Nigeria has attracted more Foreign Direct Investment (FDI) capital than any other Sub-Saharan country, and the second most FDI projects since 2007. At the same time, Greenfield FDI projects grew at a compound rate of almost 20 %. (Ernst & Young 2014).

While over half of all FDI capital has been invested into the capital intensive resource sectors (primarily oil) since 2007, almost half of the FDI projects are service-oriented. Strongest growth is in telecommunications. Other growing service sectors include financial services, consumer products, tourism, and business services. (Ernst & Young 2014). However, growth and poverty reduction seem to be an urban phenomenon. In rural areas lower assessed growth in agriculture is consistent with persistent poverty. (The World Bank 2014, 18).

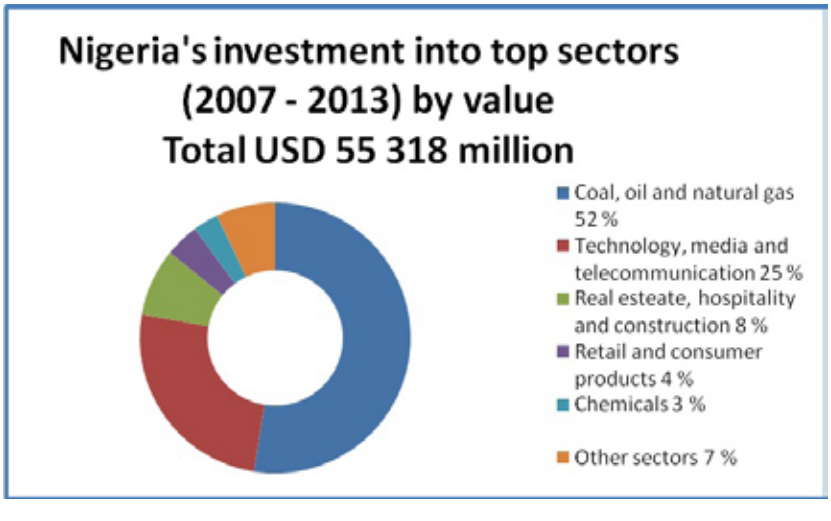


Figure 1. Top Investment Sectors in Nigeria (Ernst & Young 2014).

Nigeria's GDP per capita numbers are still far behind South Africa, which is ranked as an upper-middle income economy. Nigeria depends heavily on primary commodities. The financial market is small as compared to South Africa (Deutsche Bank 2014, 1). The positive development of Nigerian economy

is still largely dependent on the performance of the oil sector and commodity prices. For Nigeria's future prosperity, improvements in non-oil growth and government revenues are critical. (The World Bank 2014, 4-15).

Ernst & Young anticipate that Nigeria will remain a key hub for investment also in the future, and is likely to become one of the most attractive developing market investment destinations in the world (Ernst & Young (2) 2014). The value of active infrastructure projects amounts to USD 100 billion in Nigeria. Examples of active infrastructure projects include:

Table 1. Examples of infrastructure projects in Nigeria (Ernst & Young 2014).

PROJECT NAME	CAPACITY AND TIME FRAME	COMPANY INVOLVEMENT	OTHER DETAILS
Lagos Rail Mass Transit (PPP) Project	Sponsored by the Lagos Metropolitan Area Transport Authority (LAMATA). • Phase one: the 27.5km Blue Line from Marina to Okokomaiko; LAMATA has envisioned a long-term plan of seven lines • Completion of phase one is pushed out to end-2015	The China Civil Engineering Construction Corp. (CCECC) is the main EPC contractor on phase one. The project is sponsored by the Lagos State Government (LSG) and will be developed by LAMATA on behalf of LSG.	This modern rail-based public transport system is the first of its kind in SSA outside of RSA. The railway equipment, including signalling, rolling stock and fare collection equipment, will be provided by the private sector. The project is also responsible for generating its own electricity. Detailed design and surveying for the entire project has been completed.
Abuja-Kaduna Rail Modernisation (PPP) Project	Upgrading to standard gauge. • 186km rail modernization network will result in a track with 36 bridges and 9 fully developed stations • In progress (brownfield); completion expected in 2014	China Exim Bank is providing a US$500m concessionary loan, the remaining US$374m comes from the Federal Government of Nigeria. China Civil Engineering Construction Corporation (CCECC) was awarded the main EPC contract.	Track laying for the single standard gauge line was officially launched in July 2013. The railway modernization initiative in Nigeria aims at replacing the existing narrow gauge system with the wider standard gauge system, while allowing high-speed train operations on the railway network
Geregu II Gas-Turbine Power Plant	Located in Ajaokuta, Kogi State. • 434 MW • The plant was turned overon schedule in mid-2013	Siemens won the turnkey EPC contract to build the power station for the Nigerian utility Niger Delta Power Holding Company (NDPHC).	The project was commissioned under the National Integrated Power Project (NIPP) plan. Geregu II is now the third gas-turbine power plant to be constructed by Siemens in Nigeria as a turnkey project. By 2020, Nigeria plans to increase the country's generation capacity by five to eightfold from its current level of approximately 5 gigawatts (GW).

Figure 2. Lagos Rail Mass Transit Project (photo Maarit Virtanen 2014).

Nigeria faces challenges

Nigeria will continue to face its fair share of challenges. Corruption, threats to physical security and poor infrastructure are often cited as constraints to business and investment growth. The national power supply per capita is among the lowest in the world. Businesses need to rely on diesel generators for their power supply. The lack of electricity, unreliability of centralised energy production and high energy costs hamper industrial development and constitute an obstacle for growth. The power sector was recently privatised and the expectation was that investment into electricity generation and distribution would increase considerably . However, the beginning of privatisation process has also raised criticism with regard to vague rules and pricing of electricity. The process may still require restructuring and orientation towards market principles instead of current price control. (Soleye 2014).

The Nigerian government has aimed at containing corruption through the enactment of laws and integrity systems. The Bureau of Public Procurement Transparency strives to improve public financial management with focus on the procurement processes, while The Nigeria Extractive Industries Transparency Initiative (NEITI) is focusing on transparency in the oil industry (Barungi 2014, 11). There is still urgent need for improvement in counter-corruption activities. Transparency International's Global Corruption Report 2013 ranks Nigeria number 144 of 175 countries, showing a deterioration from previous year. (Transparency International 2014.)

The security situation also remains a cause for concern in Nigeria. Because of the insurgent activities of Boko Haram, the militant Islamist group, three Northern states have declared the state of emergency. The Delta Area also faces continuous unrest. Corruption and insecurity seem to be interlinked. Also the persistence of poverty in the North East and North West is likely

related to the security situation (The World Bank 2014, 22). There is a wide variety between different regions in all aspects.

Figure 3. Foreign travel advice for Nigeria (UK Government 2014).

It seems that although the economy is growing in Nigeria, the growth is not inclusive and the number of people living in poverty is not decreasing. There is a strong divide between the North and South in poverty and poverty reduction. Also the contrast between urban and rural areas is striking. African Economic outlook for Nigeria 2014 states that the focus of current policy dialogue and initiatives is in poverty reduction, mass job creation and protection of the most vulnerable and those in the large informal sector. The focus in 2014 budget is mostly on job creation and making the growth more inclusive. (Barungi 2014, 3.)

Renewable energy market potential

According to an estimate, Nigerians produced 6 000 MW of electricity by diesel generators in 2012 (Gaines 2013), which is about the same amount as the centralised power generation for the grid (Reegle 2014). As described earlier, the lack of energy inhibits economic growth, not to mention the health and environmental impacts related to the use of diesel generators. Nigerian government has plans for significant increase in energy generation utilising especially the national gas reserves.

Nigerian government is committed also to accelerating the development of renewable energy, as stated in the National Energy Policy and Vision 2020-20. Policy and regulatory framework revisions include the feed-in-tariff for renewable energy as a part of the Multi-Year Tariff Order and privatisation of state-owned generation and distributions companies. In addition, revised Renewable Energy Master Plan is under process for ratification.

Table 2. Nigerian renewable energy targets by resource (Energy Commission of Nigeria 2012).

RESOURCE	NOW (2012)	SHORT TERM (2013-2015)	MEDIUM TERM (2016-2020)	LONG TERM (2021-2030)
Hydro (LHP)	1938	4000	9000	11250
Hydro (SHP)	60	100	760	3500
Solar PV	15	300	4000	30005
Solar Thermal		300	2136	18127
Biomass		5	30	100
Wind	10	23	40	50
All Renewables	1985	4628	15966	63032
All Energy Resources	8700	47490	88698	315158
% of Renewables	23	10	18	20
% RE Less LHP	0,8	1,3	8	16

Table 3. Feed-in-tariffs (Gaines 2013).

RESOURCE	GERMANY 2013	NIGERIA MYTO* 2013	NIGERIA MYTO 2016
Solar	11,27 (-2,2% monthly regression)	35,42	44,55
Offshore wind	15		
Onshore wind	8,93	12,81	16,16
Hydropower small	5,5 (10,31 for new plant)	12,29	15,47
Hydropower large	5,5 (10,31 for new plant)	2,56	3,22
Biomass	11	14,31	18,05
Landfill gas	5,89		

* Multi-Year Tariff Order

Solar energy

Nigeria is located within the high sunshine belt, and has accordingly vast potential for solar energy generation. Solar energy potential is especially good in the northern part of country, but large development projects are planned also for the southern Delta area. The emphasis is on solar PV projects, solar thermal solutions are used mainly at small scale, for example, in agriculture (Nwoke 2014).

Several countries, like Germany, United States and Canada are actively supporting solar PV development and investments in Nigeria. For example, in May 2014, SkyPower FAS Energy signed agreements for the development of 3 000 MW of utility-scale solar PV projects that should be built in the next five years in the Delta State (SkyPower News 2014). Nigerian-German Energy Partnership emerged in 2007 and includes several energy related projects. There are plans for, for instance, 420 MW of solar power plants in nine northern states (PV Magazine 2013). In July 2014, the European Union committed 3,4 billion Naira (15,5 million Euros) for boosting renewable energy and rural electrification (Premium Times 2014). In 2014, the installed capacity for large scale grid connected solar PV was around 30-50 MW (Soremekun 2014).

Besides large scale solar PV, market opportunities exist for off-grid solar PV applications at different market sectors. These include, for example, agricultural applications, solar and hybrid solutions for telecommunications sector, security systems, solar street lights and solar traffic lights. (Soremekun 2014.) For instance, at telecommunications sector thousands of base stations are fuelled by diesel generators. This entails huge costs for maintenance and transportation of fuel. High electricity prices are also an obstacle for many small and medium sized companies, which could well benefit from renewable energy, especially if they can be supported with getting affordable loans for the investment (Adaju 2013).

In fast growing cities, there is a huge shortage of housing and new residential areas are being built like Lagos, rapidly. There are major problems related to inadequate energy supply, which renewable energy could help to solve, but the initial costs are perceived high. If renewable energy generation is integrated into the estate planning from the beginning, it has potential to be both sustainable and cost-efficient. The housing sector faces, however, also challenges related to inadequate planning and regulation, poor quality of construction and lack of awareness on available options. Capacity building on combined energy solutions for housing is needed throughout the value network. (Connect project 2014).

Wind Power

Wind conditions are most favourable for energy production in Northern Nigeria and on coastal areas. The potential for hybrid solutions (solar and wind) is good in most parts of the country. Examples of projects include the Katsina Wind Farm Project, which consists of 37 Vergnet 275 kW wind turbines. The

Figure 4. Solar street lights in Lagos (photo Maarit Virtanen 2013).

project has been delayed due to security reasons, but it is expected to be finalised by the end of year 2014. (African Examiner 2014). Small wind turbines are used, for example, for water pumping and small facilities, like schools and clinics (New ERA Energy 2014).

From Bioenergy to Waste to Wealth

Bioenergy potential in Nigeria is substantial at different sectors: agriculture, industries and households. However, bioenergy is little utilised at the moment. One of main challenges for bioenergy is the availability of waste. Even though cities like Lagos generate huge amounts of biodegradable waste, it is difficult to utilise it, because biodegradable waste is not separated from the waste stream. In Lagos, there are few operating biogas plants: biogas is generated from fruit waste at Ikosi fruit market area, from restaurant waste and fish waste. Other potential sources include abattoirs and food industries. In agriculture, seasonal production creates challenges for biogas production that would work optimally with one main feedstock instead of changing raw materials. (Phil-Ebosie 2013.)

In rural areas, agriculture is often subsistence based and scattered. Bioenergy opportunities exist mainly on larger farms or, for instance, at abattoirs. In Ebonyi State, which is Nigeria's leading producer of rice, Abakaliki Power Plant Limited has been set up to implement and operate a 5 MW cogeneration plant utilising rice husk. An international bidding for the project has been prepared with support from UNIDO. (APPL 2013.)

Figure 5. Food market at Ikosi, Lagos (photo Maarit Virtanen 2014).

Biogas and other waste to energy –solutions were discussed in two workshops organised by Connect project in Lagos and Abakaliki in Ebonyi State in March 2014. Both workshops had 30-40 participants from different state ministries, universities, companies, NGOs and other organisations. The development needs identified during the workshops included collection of baseline information on waste for identification of utilisation opportunities, development of waste management services and sorting of waste, and creating solutions developed for local conditions. Overall, there are various opportunities for turning waste from problem to a source of revenue including bioenergy, but not limited to that. Full utilisation of opportunities requires, however, organised waste collection and sorting. (Connect Project 2014.)

In most urban and semi-urban towns, there is noticeable environmental degradation, which can be linked to improper management and disposal of municipal and household wastes. This has resulted in environmental problems like flooding due to blockage of drainage lines by wastes, contamination of ground and surface waters by run-offs from dump sites and steady deterioration of air quality caused by obnoxious gases emitted from open-air combustion of waste. Knowledge on waste management and appropriate waste handling solutions is needed for all stakeholders.

Connect project activities in Nigeria

During the Connect project, network creation to Nigeria has been studied and piloted. In Finland, Nigerian alumni and students have been involved in information gathering and networking with companies, while in Nigeria cooperation has been initiated with universities, companies, NGOs and other organisations. Below is an example of network potential, listing some organisations met during the project.

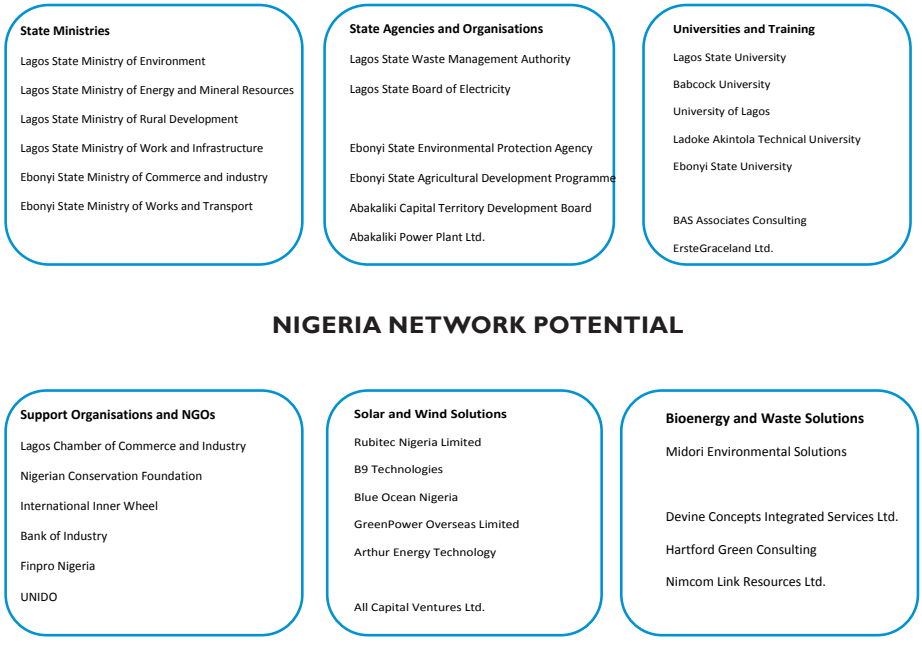


Figure 6. Example of Nigeria network potential (Jäättelä, R. & Virtanen, M. 2014).

The cooperation in Nigeria has focused in two very different states: Lagos and Ebonyi. While Lagos is among the fastest growing megacities in the world with some 15-20 million inhabitants, Ebonyi State is mostly rural with around 2-3 million inhabitants. In Lagos, many development needs are related to rapid urbanisation, whereas Ebonyi State faces challenges related to, for instance, lack of infrastructure and capabilities that hinders the state to achieve its full potential, especially in rural areas.

Figure 7. Street view in Abakaliki, Ebonyi State (photo Maarit Virtanen 2014).

The interest for cooperation and networking possibilities were evidenced in four workshops organised in Lagos and Abakaliki. Although the Finnish renewable energy companies were not ready to attend the trip, the workshops were a success with 90 different participants from various organisations and lively discussions. In the feedback survey, 21/27 respondents assessed the workshop as very or extremely useful. 18/27 had started new contacts or activities initiated by the workshop and 24/27 said they would definitely attend similar meeting again.

Workshops brought together stakeholders from ministries, universities and NGOS for the very first time, hopefully opening new cooperation locally. At least in Ebonyi State, the discussions on developing waste management have continued between Ebonyi State University and Ebonyi State Environmental Protection Agency. Possible involvement of Finnish companies has also been discussed.

Another interesting case in Ebonyi State is about utilising the rice husk produced in various rice mills. Ebonyi is the largest rice producer in Nigeria, which also means large amounts of rice husk as by-product. The possibilities of producing biogas from the husk or pelleting it were studied in the Connect project. Pelleting of husk proved a more viable option, but would require further development. Networking and cooperation has also resulted in a concrete solar PV project. The cooperation with InnerWheel Nigeria eventually led to electrification of a rural health clinic with solar panels.

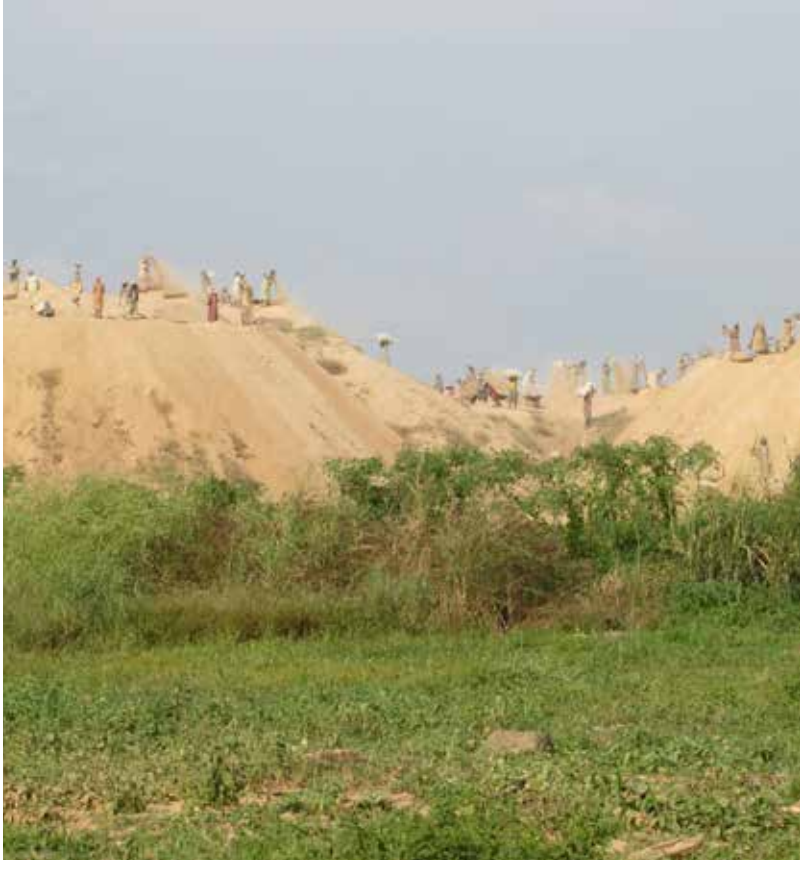


Figure 8. Rice husk in Ebonyi State, Nigeria (photo Ritva Jäättelä 2013).

Cooperation between the Ebonyi State University and FUAS in CONNECT-project

Ebonyi State University (EBSU) signed a Memorandum of Understanding related to the Connect project with Laurea UAS, Member of the Federation of Universities of Applied Sciences (FUAS) in November 2012. In Connect project, the mutual aim for both FUAS and EBSU is to search for new possibilities and in co-creation develop new sustainable network modes to support SMEs in both countries in establishing and operating sustainable business networks in renewable energy sector. EBSU and FUAS organised jointly workshops in March 2014 to better understand the current situation in Ebonyi State and to identify areas for collaboration.

The Vice Chancellor of Ebonyi State University, Engr Prof. Idike, F. I. approved the hosting of research workshops and brainstorming sessions in collaboration with Connect project on the 3rd and 4th March, 2014. Workshop invitations were sent to State Ministries and establishments and an overwhelming participation was recorded. Ministry of Agriculture, Ministry of Commerce, Ministry of Utilities, Ministry of Works and Housing, Ebonyi State Agriculture Development Program, Ebonyi State Environmental Protection Agency, Ebonyi State National Population Commission, Ebonyi State-UNIDO, Abakaliki Capital City Development Board and Inner wheel District 914 sent representatives. EBSU staff in the areas of climate change, waste to energy and bioenergy, renewable energy, sustainable housing, as well as biodiversity and conservation all took part in the program. Four workshops of 3 – 4 hour duration each were anchored with desired accomplishment.

The vision of EBSU to rank among the best citadels of learning in the world with excellence in learning, research and especially community service was brought to bear by the workshops' research brainstorming sessions. The program brought EBSU further ahead in realising one of her objectives: "to relate its activities to the social, cultural and economic needs of the people of Nigeria (Ebonyi State) in particular and the world in general." As a result of workshops, the first round table meeting and brain storming sessions with Government Ministries and establishments were held. Stakeholders discussed common issues about the development of Ebonyi state and solutions through research were unanimously decided.

In terms of issues discussed at workshops: waste management, sustainable urban housing, environmental conservation and sustainable food production, it was agreed that a synergy between EBSU and the government ministries/establishments charged with the specific responsibilities needs to be developed. This will enable efficient tackling of problems using research based solutions. Valuable contributions were gathered from workshop participants that will be used in developing research proposals for grant applications in sustainable housing in new residential areas, waste to energy and bioenergy, biodiversity and environmental change issues related to climate change and sustainable food production.

In line with EBSU's community development and vision on impacting the immediate community and her contribution to environmental enlightenment, a course on environmental issues and waste is recommended to be developed by EBSU for all students as community service. This course will teach the students the rudiments of environmental issues and waste management, which they will in turn communicate to people in the streets, markets, primary and secondary schools. Student's graduation may also be tied to participation in the course.

As a final result, the workshops afforded Ebonyi State Environmental Protection Agency (EBSEPA) the opportunity to open up a discussion with FUAS to link EBSEPA with Finnish companies that will aid her start meaningful waste management. EBSU International Linkage office is also in the centre of the plan. The processing of this plan is still ongoing. Overall, EBSU is resolute to support the collaboration with FUAS.

Discussion

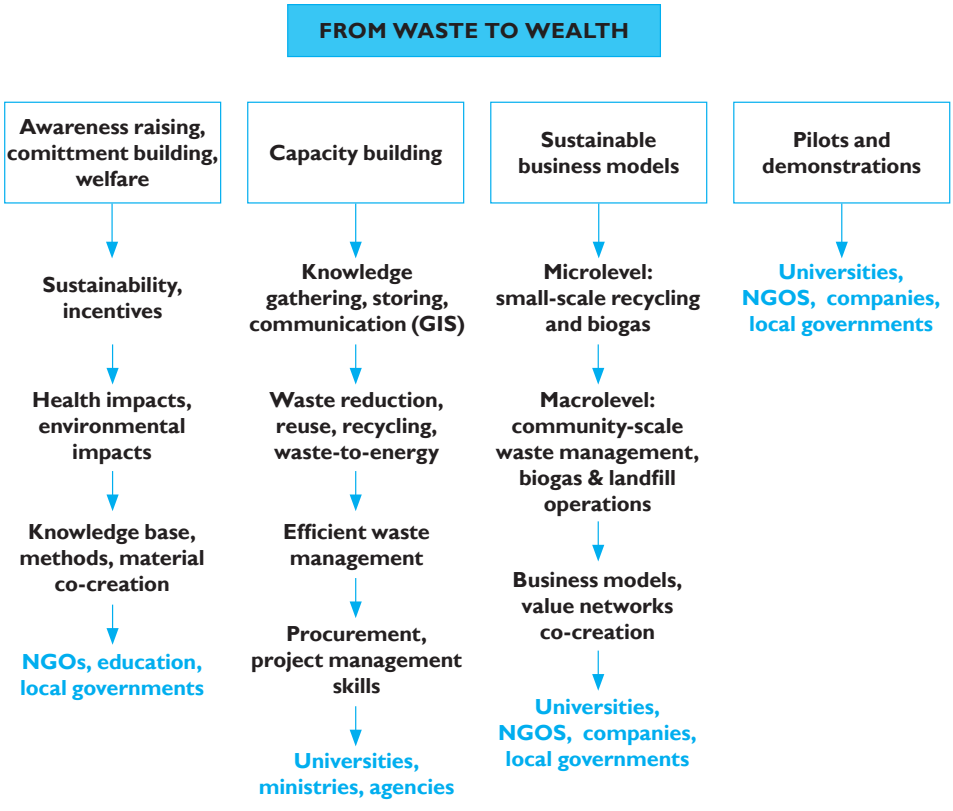
The networking and cooperation during the Connect project has showed many collaboration possibilities and vast market opportunities for Finnish renewable energy companies. However, Nigeria is also a challenging market, and there is a need for sustainable, long-term partnerships through which products and solutions can be developed to fit local circumstances. University cooperation could be a way to identify market possibilities, to create networks, to find needed baseline data for planning solutions, and to co-design locally adapted solutions. This cooperation could also support capacity building efforts, which are needed in many levels.

Nigerian students and expats in Finland have demonstrated clear interest in bridge-building between Finnish and Nigerian companies. Nigerian students' and expats' understanding of local realities could become a real asset for Finnish companies. Complementary capacity building in business skills and industry understanding is needed in most cases to realize the potential benefits.

In Lagos and Abakaliki workshops, the need for community awareness raising and commitment creation as well as knowledge transfer and capacity building throughout the value network were seen as essential elements for promoting renewable energy. Introduction of small-scale solutions, adaptation to local conditions and viable networks were seen as key to successful implementation. The need for holistic solutions and involvement of all stakeholders from representatives of ministries and agencies, educational organisations, financing bodies, NGOs and private companies were seen as essential.

During the Connect project, waste management and utilisation came up as one of the sectors in which collaboration between Finnish and Nigerian actors could be beneficial. Based on the workshops results and other insights throughout the Connect project, the following approach was modelled:

Figure 9. Waste to wealth approach (Jäättelä R. & Virtanen M. 2014).



The waste to wealth approach has been developed further during autumn 2014 with FUAS and partners identified during the Connect project in Nigeria, South Africa and Kenya. The aim is to continue the cooperation also after the project and strengthen the networks created.

References

Adaju, S. 2014. CEO. Blue Ocean Ltd. Interview 7 December 2013.

African Examiner. 2014. Katsina Wind Farm; Nigeria After Alternative Energy [referenced 7 October 2014]. Available at: http://www.africanexaminer.com/katsina-wind-farm-nigeria-after-alternative-energy/

Amobi, B. 2014. Brief about Nigeria in the World. Presentation of HE Ambassador of Nigeria. Exploring Business Opportunities in Nigeria –seminar. Laurea University of Applied Sciences. 24 October 2014.

APPL. 2013. Abakaliki Power Plant Limited [referenced 18 November 2014]. Available at: http://applbiomass.com/

Barungi, B. 2014. Nigeria 2014: Full Country Notes. African Economic Outlook. African Development Bank [referenced 8 November 2014]. Available at: http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Nigeria_EN.pdf

Connect Project. 2014. Summary of Workshops in Abakaliki and Lagos, March 2014 [referenced 8 October 2014]. Available at: http://www.laurea.fi/en/connect/news-and-events/Documents/here.pdf

Deutsche Bank. 2014. Nigeria, the Nr. 1 African Economy, Research briefing [referenced 12 October 2014]. Available at: http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000333240/Nigeria%3A+The+No_+1+African+economy.PDF

Ernst & Young. 2014. Africa by Numbers: A Focus on Nigeria. Special report issued for: World Economic Forum on Africa 2014 [referenced 12 October 2014]. Available at: http://www.ey.com/Publication/vwLUAssets/EY-Nigeria-Country-Report/$FILE/EY-Nigeria-Country-Report.pdf

Ernst & Young. 2014 (2). Africa 2014: Executing growth [referenced 12 October 2014]. Available at: http://www.ey.com/Publication/vwLUAssets/EY-attractiveness-africa-2014/$FILE/EY-attractiveness-africa-2014.pdf

Gaines, J. 2013. Overview on Renewable Energy Projects, Feed in Regulations and Solar Energy in Nigeria [referenced 2 October 2014]. Available at: http://nigeria.ahk.de/fileadmin/ahk_nigeria/Veranstaltungen/Renewable/Dr._Jeremy_Gaines_Renewables_Nigeria.pdf

GOV.UK. 2014. Foreign travel advice, Nigeria [referenced 13 October 2014]. Available at: https://www.gov.uk/foreign-travel-advice/nigeria

Jäättelä, R. & Virtanen, M. 2014. Market Opportunity Identification through New Networks in Africa: Case Nigeria. Presentation at Connect Project seminar 15 May 2014 [referenced 3 November 2014]. Available at: http://www.laurea.fi/en/connect/seminar/presentations/Pages/default.aspx

New ERA Energy. 2014. New Era Energy News. [referenced 7 October 2014]. Available at: http://www.neenigeria.com/html/news.html

Nwoke, O. 2014.Summary of Activities at the National Centre for Energy Research and Development (NCERD), University of Nigeria, Nsukka. Presentation at ECOWAS Solar Thermal Energy Capacity Building and Demonstration Programme.13 -14 June 2014, Praia, Cape Verde.

Phil-Ebosie, A. 2013.CEO.Midori Environmental Solutions. Interview 10 December 2013.

Premium Times. 2014. Renewable energy: EU supports Nigeria with N3.4 billion [referenced 2 October 2014]. Available at: https://www.premiumtimesng.com/business/165095-renewable-energy-eu-supports-nigeria-with-n3-4-billion.html

PV Magazine. 2013. Nigeria partners with Germany on 420 MW solar projects [referenced 2 October 2014]. Available at: http://www.pv-magazine.com/news/details/beitrag/nigeria-partners-with-germany-on-420-mw-solar-projects_100013206/#axzz3EyAEN7KK

Reegle. 2014. Policy and Regulatory Overviews: Nigeria (2014) [referenced 3 October 2014]. Available at: http://www.reegle.info/policy-and-regulatory-overviews/ng

SkyPower News. 2014. SkyPower Global and FAS Energy to build 3,000 MW of solar power in Nigeria at US$5 billion [referenced 2 October 2014]. Available at: http://www.skypower.com/skypower-news-may6-2014.php

Soleye, T. 2014. Guest post: the imminent collapse of Nigeria's power privatisation is a good thing [referenced 28 October 2014.] Available at: http://blogs.ft.com/beyond-brics/2014/10/21/guest-post-the-imminent-collapse-of-nigerias-power-privatisation-is-a-good-thing/

Soremekun, A. 2014. Business Opportunities in Renewable Energy Solutions in Nigeria. Presentation at Lagos State Climate Change Summit. 18-20 March 2014. Lagos, Nigeria.

Transparency International. 2013. Corruption Perception Index 2013 [referenced 12 October 2014]. Available at: http://www.transparency.org/whatwedo/publication/cpi_2013

The World Bank. 2014. Nigeria Economic Report, No.2 July,2014 [referenced 8 November 2014]. Available at: http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/07/23/000470435_20140723133415/Rendered/PDF/896300WP0Niger0Box0385289B00PUBLIC0.pdf

World Population Review. 2014. Nigeria Population 2014 [referenced 12 October 2014]. Available at: http://worldpopulationreview.com/countries/nigeria-population/

Kenya – The Leading East African Economy in Marathon for Extra Energy

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Kenya is the primary commercial and financial hub of East Africa. It has the best transport infrastructure and well-developed ICT and service sectors in the region. It is also the leading economy in East and Central Africa by Gross Domestic Productivity (GDP). One of the main limiting factors to social and economic development in Kenya is the lack of and limited access to energy. The Kenyan administration has recognized the vital role renewable energy can play in addressing this limitation. In addition, the legislative framework has been designed to emphasize, enable and promote the role of private sector investment (domestic and foreign) in addressing these identified needs.

Today Kenya has a population of 43 million (Table 1). It is estimated that the population will reach 63 million by 2030 and the majority of the people will live in cities. Kenya is a member to the East African Community (EAC), whose current combined population is over 120 million (UNDB 2008). Kenya has a well-educated and growing middle class with a good range of both public and private schools. English is spoken both in the formal and informal setting.

In Vision 2030 and the second medium-term-plans the government has identified the priority growth sectors to be tourism, agriculture, wholesale and retail trade, manufacturing, ICT (Business Process Outsourcing), and financial Services. In the MTPII 2013-2017, oil, gas and the extractives are featured prominently in line with the growing interest in the sector sector. (Government of Kenya 2013.) Even if the contribution of ICT to the local economy is very recent, Kenya is considered to be one of the most advanced countries on the continent, and a leader in user-led ICT innovations. Banking and communication industries have rolled out ICT packages that serve particular niches in the society from farming, money transfer, micro-loaning to savings. There is hope and optimism that ICT can be further harnessed across the economy and in government. The government has actively started using ICT in various departments and sectors to improve governance, weed out corruption and improve service delivery.

Infrastructure development, the extractives and the real estate are the fastest growing sectors. The Kenya Vision 2030 has identified energy as a key foundation and one of the infrastructural "enablers" upon which the economic, social and political pillars of this long-term development strategy will be built. The Kenya Government has an ambitious programme to rump up the generated energy from the current 1700 MW to 5000 MW in 40 months from a mix of sources. (Government of Kenya 2013.)

Table 1. Summary Facts of Kenya.

INDEX	FACT	NOTES
Population	45 Million	30 % connected to electricity
Capital	Nairobi	Population 4 Million
Area	582,646 sq Km (224,961 sq M)	
Main Exports	Tea, Coffee, Petroleum products, Horticultural products	ICT, Extractives (New)
Energy Sources	Mini Hydro Energy Solar Energy Petroleum Energy/Coal Wind Energy Biomass Energy	Potential 3,000 MW Not Quantified 3000 MW planned 385 MW planned (The government has installed 61 wind masts for data collection at various locations to inform wind power development in the country.) Not quantified
Current Energy Status	2000 MW (Gacheche 2014)	5000 MW (planned within 40 months) ((Sherelle 2014)
Official Languages	English, Swahili	There are more than 57+ ethnic languages & groupings in Kenya

A growing demand for energy and a growing middle income

According to the Africa Energy Outlook report (2014) by the International Energy Association (IEA), the rate of population growth in Sub-Saharan Africa (SSA) has outpaced efforts to promote electrification, slowing down social and economic development in the region. The IEA report also states that only 290 million of 915 million people living in SSA have access to electricity. However, the same report points out that, investment in new energy supply is on the increase, a fact is re-emphasized by the Central Bank of Kenya (Government of Kenya 2014). In line with the SSA projection, at the moment 70% of Kenyans do not have access to modern energy services (Government of Kenya 2008) and rely on a raw biomass for their daily energy needs (FFRC 2014).

Figure 1. Charcoal for sale on a street in Nairobi (photo Paula Linna 2014).

The energy sector is critical to Kenya´s social-economic development. Kenya like other African countries has a rapidly expanding middle class. The rapid socio-economic transformation is having a direct impact on the demand for modern energy services. The gap in the current energy demand and access plus the projected future needs is an open investment opportunity. Competitive and niche oriented solutions are key to the market entry. The Connect project research has established that there is a high level of commitment by the central and county governments to deliver energy solutions to meet the identified needs.

The county governments of Machakos, Turkana, Marsabit, Embu, Kwale and Nakuru were particularly keen on exploring the means to increasing the energy generation from a mix of sources including waste. The county governments have realised that with the changing lifestyles, the demand for energy solutions continues to grow, as the manufacturing and energy intensive services expand. There is a need for massive investment in new energy generation capacities and upgrading the supply systems to meet the projected extra load and growing demand. At a national level , the Government plans to develop new high-capacity transmission lines between Mombasa and Nairobi (475km), Nairobi ring (100km), Lessos-Tororo (127km), Olkaria-Suswa (50km), Olkaria-Lessos-Kisumu (300km), Kenya-Tanzania (100km), Loiyangalani-Suswa (430km) and Ethiopia-Kenya (686km). (Odhiambo 2014.)

Power is generated by the Kenya Electricity Generating Company (KenGen), which is a publicly listed company. It generates 80% of the electricity consumed in Kenya from a variety of sources including hydro, geothermal, thermal, solar, and wind. The rest of the energy comes from Independent Power

Producers (IPP) plus thermal generators. Kenya's current effective installed (grid connected) electricity capacity stands at about 1,700 MW (KenGen 2014) and should soon be at 1880 MW following the extra power from new geothermal wells (Aderibigbe 2014).

Of the energy KenGen produces, 70% is from renewable sources (geothermal and hydro). Hydro resources account for nearly half of the country's total electricity generation capacity. This over reliance often leads to failure during dry seasons when water levels drop. To address this risk, Kenya is currently planning to produce over 5000 megawatts from a mix of sources including more renewable options.

The distribution and transmission of power in Kenya is done by Kenya Electricity Transmission Company Limited. Kenya Power sells electricity to over 2.6 million customers (as at April 2014) in a country with a population of 45 million. (KPLC, 2014.)

Table 2. Challenges for the future energy supply

Poor Quality Grid distribution network
Generation capacity
Growing population
Expanding economic and manufacturing sectors
Poor integration of the different energy mix
Inadequate Investment
Return on Investment affected by poor strategies of integrating energy supply to sectors of growth
Competition from Cheaper Technologies and Alternatives

Renewables as part of the energy portfolio

Kenya officially launched the ambitious project to produce 5,000 MW of electricity in 40 months in 2014 (IMF 2013, Gitonga 2013). The government hopes this will drive its target of growing the economy by 10%, as envisaged in the Vision 2030 economic growth plan. The government is targeting power generation from geothermal, solar, wind, small hydro, liquefied natural gas (LNG), and coal. This will increase the local level of accessibility to electricity to more than 70% by 2016 and reduce the energy cost by 40% to the consumer. In real terms, even if the government meets its target of 70%, past 2016 there will still be 30% of the over 45 million inhabitants without access to modern energy services. This is a sector of the society that needs to be mapped and innovative solutions developed for it.

As the different sources of energy expand, creative solutions are needed to deploy stable energy generation systems and automation technologies to effectively deliver this energy generation mix and where possible seamlessly feed it to the grid. The new energy solutions emphasize the need for flexibility from the energy providers in their operations, and research and development strategies. This approach to energy sourcing opens up new opportunities linked to the appropriate simple off-grid solutions and seamless integration solutions when connecting to the grid.

Figure 2. Solar energy at a Kenyan school (photo Paula Linna 2014).

In Kenya, the expansion of power generation targeting to bridge the supply gap is being implemented through a mixture of investment methods including contracting Independent Power Producers (IPPs) and through Public Private Partnerships, whereby private investors enter into joint ventures with the Kenya Electricity Generating Company (KenGen) through the Feed in Tariff (FIT) policy framework (IEA 2014). FIT is one of the policy tools that the government is using to create the enabling environment through which investment opportunities can be exploited. FIT also guarantees that there is a balance between the investor expectations, the benefit to the citizens and the country as a whole.

Kenya´s greatest renewable energy potential is in the rural areas where the market is still highly under-served. Working with the new County Governments, and through the various tools such as Public Private Partnerships (PPP), it is possible to invest in innovative off grid systems and energy plants that will drive the local economy. Most county governments have funds set aside to co-finance such initiatives. Investing in renewable energy will ensure a reduction in emissions, enhance energy supply, stimulate economic competitiveness and create employment opportunities. It will also reduce the country´s dependence on imported fuels and aid in coping with the global scarcity of fossil fuels and its price volatility.

Solar -Off-grid steadily rising

According to a review article by the Renewable Energy World, Kenya is seen to be less enthusiastic about on-grid solar projects, but has pursued a policy of ramping up off-grid solar production in rural areas as part of its 2009 Rural Electrification Master Plan (Sherelle 2014). The Rural Electrification Authority (REA) states that so far around 744 public places in isolated areas, from health centres to schools, have been hooked up to off-grid solar power through the initiative (Government of Kenya 2014). Demand for PV panels is estimated to have risen by around 200 kW peak. Five off-grid stations have been put in place and enjoy an internal rate of return of 20%. For example, a British company SolarCentury installed a 1 MW Solar system for Williamson Tea in Changoi Kenya. This covers 30% of the tea estate energy needs with the annual generation of 1,600,000 kWh and with CO2 savings per year of 1,200 tonnes. This is East Africa's largest solar farm. In addition, a Dutch solar company Ubbink has established its operations in Kenya and is producing solar products from within Kenya in collaboration with a Kenyan company Largo Investments.

Harnessing the power of wind

The potential in the country is huge, especially in locations that have favourable terrain and predictable wind and daily temperature conversion regimes. There are plans to build and invest in wind energy in Marsabit (500kw). Lake Turkana Wind Power estimates that it will have the capacity to provide 300 MW to the national grid, Nyahururu (61 MW) and Kipeto (100 MW).

KenGen also intends to increase its installed capacity for wind energy at the northern part of the Ngong Hills from the current 5.1MW to 25.5MW. Kipeto project is a joint action between CraftsSkills East Africa and US General Electric. CraftSkills has been working with a Finnish NGO (Shalin Suomi ry) over the last eight years developing domestic affordable wind turbines installed in schools and in one indigenous eco-lodge in Cherangany, Pokot

Figure 3. Small-scale wind power (photo Paula Linna 2014).

Aelous Kenya has received a licence from the Energy Regulatory Commission for the construction of a 61 MW wind plant at the Kinangop area, while the construction of the 300 MW LTWF in the northern Kenya recently received a boost after the European Union gave Sh3.5 billion grant for the project. It had stalled for more than two years due to failure by the Lake Turkana Wind Power Company to acquire necessary guarantees for its construction. In addition, Vestas and ABB signed a memorandum of understanding to jointly develop power technology and system integration solutions for remote off-grid and micro-grid communities in Kenya under the Wind for Prosperity development program.

In hydropower the highest potential is in mini-hydro

KenGen manages 14 hydropower stations producing 766.88MW of power. This represents 64.9 % of the total installed capacity by KenGen. Small hydro generators are estimated to hold the potential to produce about 3,000 MW of electricity according to a UNIDO 2013 report. The same report highlights where the potential small hydropower sites are located- mainly in the South-West of Kenya (Lake Victoria drainage basin in Nyanza and Western and adjacent districts of Rift Valley); southwest of Mount Kenya – Aberdare Mountains (Central, Mt. Kenya adjoining districts of Eastern and Laikipia District of Rift Valley). The small hydropower potential is concentrated in districts with high population density and high-energy demand thus providing favourable conditions for the deployment of small hydropower on a commercial basis. This represents a huge opportunity for investing in mini-hydro.

Waste and biomass energy opportunities are a megatrend

Kenya has an expanding biogas production base but the most common use of biomass is incineration or burning to produce heat. This sector is highly under-exploited with urban solid and agriculture waste offering co-creation opportunities. With a growing population, expanding economy and changing lifestyles, waste generation is set to grow and expand. While data on the quantities and type of waste is not easily accessible, waste is generally recognized as both a problem and an opportunity. The county governments of Embu and Nakuru have in particular expressed an interest in developing waste management systems with a view to generating energy, recovery of gas and developing enterprises based on recycling.

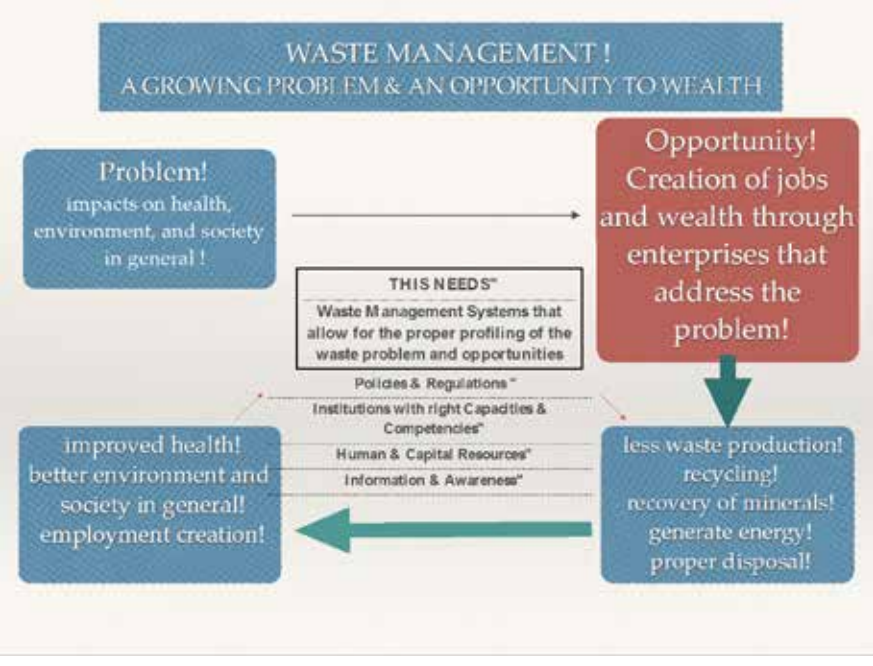

Figure 4. Waste management, a growing problem and an opportunity to wealth creation (figure Peter Kuria 2014).

On a mega scale, a few sugar companies are already using an agriculture processing by-product bagasse to produce power for their own use. Via the Purchasing Power Agreements (PPA) tool they are able to sell the excess to the national grid. Mumias Sugar Company sells about 26 MW to the National Grid. This is a potential that has not been exploited fully by other sugar companies such as Nzoia Sugar Company, South Nyanza Sugar Company, Miwani Sugar Company, Butiali Sugar Company, Chemilil Sugar Company and Muhoroni Sugar Company. The new Shimoni Sugar Factory in Kwale, however has plans to generate power from baggase. The opportunities specific to agricultural waste can be seen in the flow diagram below.

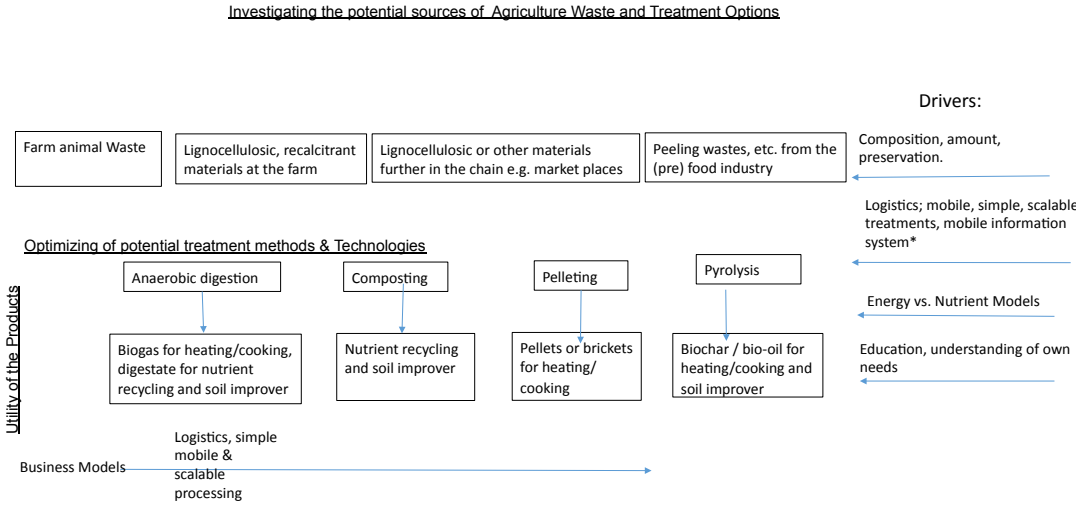

Figure 5. Agricultural waste treatment options (Annukka Pakarinen 2014)

Steaming the economy from geothermal - The leading African country in geothermal development

Geothermal power has been highlighted as a very important source of energy in Kenya. Kenya has more than 14 high temperature potential sites along the Kenyan Rift Valley with an estimated potential of more than 15,000 MW. So far only a fraction of this has been exploited. The Geothermal Development Company (GDC) is a 100% state-owned company, formed by the Government of Kenya as a Special Purpose Vehicle to fast track the development of geothermal resources in the country. GDC will drill 1400 steam wells to provide steam for the generation of 5,000MW of geothermal power by 2030. GDC has started the geothermal steam power generation project on the Menengai crater in Nakuru and expanded its operations in Ol Karia. This will considerably ease Kenya´s high dependency on hydropower and costly diesel powered generators. (GDC 2014).

Although geothermal energy supply is virtually limitless, there are massive upfront costs required prior to its extraction. In the short term, about 887 MW of geothermal power will be developed in Olkaria, Menengai, Baringo, Suswa, Longonot, and Akiira areas. The construction of the 280 MW geothermal power plant by KenGen in Olkaria is expected to be completed by the end of 2015 (Ibid.).

Fossil fuel – still going strong

This article does not cover the fossil fuels per se; however, Kenya has discovered commercial scale fossil fuels with exploitation set to begin as early as 2016. The sector has many emerging opportunities especially related to associate risks to the oil sector, like spillage and containment of fires.

A Responsive and Supportive Regulatory Framework

Table 3. Positive trends affecting the adoption of renewable energy and reforming of the energy sector

Kenya's greenhouse gas emissions are expected to increase rapidly in the near future as it continues to develop.
Inadequate access to affordable energy limits opportunities for the poor, women and children in particular.
More than ever, customers are demanding for conscience production as citizen take their role dealing with carbon footprint. Therefore investments are likely to grow in an environment that guarantees an edge on the carbon footprint of production.
An aging national grid
Growing population
Increasing small industry and industrialization
Political will to develop the energy sector and supportive regulatory framework

Among the trends (Table 3) affecting the energy sector is the favourable regulatory framework. The energy Bill 2013 has a special emphasis on renewable energy. The Renewable Energy Feed-in-Tariff System is an investment tool that is supported by a framework for connection, purchase and distribution of energy. At the same time, the constitution of Kenya guarantees protection of investments against expropriation of private property by government. Kenya is also a signatory and a member of the Multilateral Investment Guarantee Agency, an affiliate of the World Bank, which guarantees investors against loss of investment to political problems in host countries. In addition, African Development Bank (AfDB) has been offering Partial Risk Guarantee to protect IPPAs in the event agencies such as Kenya Power fail to honour their obligations. This enhances the credit to the project and secures cash flows to enable the IPPs to make timely repayments of their debt (AfDB 2013).

In March 2008, the country adopted the feed in tariff policy, based on the realization that renewable energy sources have the potential to generate income and employment. A revision in 2010 was designed to encourage private sector investment in electricity generation from renewable sources. According to the provisions of the Foreign Investment Protection Act, foreign investors may freely transfer profits after complying with tax obligations.

The FIT policy instrument makes it mandatory for energy companies, responsible for operating the national grid, to purchase electricity from renewable energy sources at a predetermined price that is sufficiently attractive to stimulate new investments in the sector. The period of power purchase agreements is 20 years.

The Kenya government is creating an enabling investing climate

The investment climate in Kenya has always been conducive especially for direct foreign investment. Several regulatory tools and instruments have been put in place to facilitate the ease of investment and doing business. The Kenya Investment Authority developed a framework that allows investors to execute their actions with ease. It takes 3-4 days to acquire all the necessary investment certificates. A foreign investor can also choose to operate their business at a 100% ownership or in partnership with local investors. The country has opened up and created investment opportunities in the energy sector, and the interest in renewable energy has increased in recent years. The government has tax and duty incentives within the energy sector to encourage the flow of resources into the sector.

Table 4. Agencies providing licenses and/or clearances for energy related projects

The Ministry of Energy: www.energy.go.ke
The Kenya Power and Lighting Company: www.kplc.co.ke
The Kenya Civil Aviation Authority: www.kcaa.or.ke
The National Environment Management Authority: www.nema.go.ke
The Ministry of Local Government: www.localgovernment.go.ke
The Energy Regulatory Commission: www.erc.go.ke
The Water Resources Management Authority: www.wrma.or.ke
Company Registration www.attorney-general.go.ke
The Ministry of Lands: http://www.ardhi.go.ke
Ken Invest: www.investmentkenya.com

The government has established service centres (Huduma Centres) to address the many layers of administration, which in the past were a source of corruption. The centres are located in all County Governments and provide services as elaborated below. All investments and businesses must comply with the environment, health and security standards set in the Kenyan laws.

Table 5. Services provided by Huduma Centres

- Provision of key information on regulatory factors.
- Issuing the investment certificate that facilitates the start of business.
- Provide information on logistics and business opportunities.
- Provide information on the sector and introduction to sector networks.
- Provide the support needed to build collaborative partnerships with Kenyan businesses.
- They also offer continued support to companies after establishment.
- All the above services are given free of charge

Sectors of growth are diverse and the centres for engagement better profiled

The key drivers to Kenya's economic growth are agriculture, tourism, the extractives sector, energy, banking services, and ICT -telecommunication. However, the largest sector in terms of employment is the informal sector. In terms of entry to the market, the new County Government structure offers a new model of doing business with government. There are challenges associated with the establishment of new institutional structures and their technical capacities, but this also offers an opportunity for the co-creation and development of appropriate solutions.

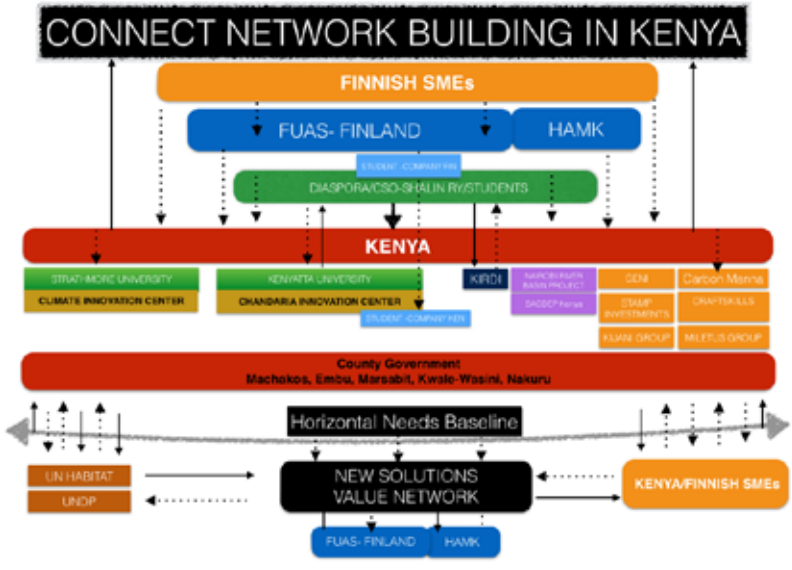

Figure 6. Approach to the Market and Networks Development (Peter Kuria 2014).

Linking the different players, networks, suppliers, vendors and actors to comprehensively address the market needs is crucial. At the interphase of academics, government and industry, students from Finland were linked with students from Kenya to design a market entry solution within the Connect project. Their solution involved setting up a student lead company to undertake market surveys and business plan development. The resulting company was able to open negotiations with the Machakos County Government on the possibility of installing solar powered street lighting. This process exposed the gaps in knowledge within the County governments, which are an impediment to the development of solid business proposals especially from international companies interested in the sector.

The Connect project Kenya team was based at Kenyatta University's Chandaria Innovation Centre. It started in November 2013. The Kenyan team was mandated to conduct research on the strategies for market entry for Finnish firms in Kenya. The team was to further develop a website that would host the student company through which these firms could operate. In addition to these, the team was to research on the requirements that a firm is supposed to fulfill to operate in Kenya as well as the current status of the companies in the Renewable energy industry. The research was conducted under various categories of Renewable energy and reports developed. The team also managed to establish a working template for the best business model that would enable the firms to do business in the country. As part of testing the template, the team successfully initiated contact with county governments and real estate development companies, which has yielded results as enumerated below

- Developed investment templates in Solar, Wind, Biomass and Mini-hydro to act as a guide for companies interested in the Kenyan market.
- Participated in Connect final seminar on 15th May 2014 and shared our findings with the participants. A video clip of the findings is available on Youtube.
- Active contact and collaboration with the student company in Finland
- Functional company website www.geniusgeni.com
- Partnership agreement with a Finnish company in Renewable Energy Oy Windside Production
- Working relationship with Machakos County Government on their Street Lighting need in their various highways, towns, Machakos city and markets.
- Working relationship with real estate development companies e.g. Residence254

By Johnson Gituma and Anthony Kinyanjui – Connect Kenya Students

Discovering the market is the first step, identifying the right tools and strategies takes a boulder leap of faith

In their strive to find new markets, Finnish SMEs will have to focus on off-grid, small-scale systems and use third party carriers to deliver their solutions, for example, through the real-estate market. Some researchers have pointed out the need for solutions and technologies for special conditions, for example, in the telecommunications sector. In our research, the areas that offer a ready entry point are linked to the real estate, which is the fastest developing sector and in need of holistic solutions from design in energy efficiency to the deployment of the technical solutions. Following this approach, the niche market is huge and there are possibilities of resourcing through innovative financing tools such as the green mortgage, being piloted by UN Habitat and Strathmore University. One key consideration is to design off-grid systems with readiness for future grid connection similar to the one designed for a tea estate in Kenya.

By collecting reliable data on the current energy needs and costs, business models that show realistic projections on the return of investment can easily be adopted. There is a local need for the professionalization of the renewable sector expertise to allow the consolidation of up to date data and in the building of robust and intelligent renewable energy management systems. New opportunities are emerging related to new institutions and huge infrastructure projects that require huge energy supply - which investors can tap into. However, this requires an active eye in the market and readiness to take a leap of faith and explore the various windows of opportunity.

While there is the recognized need to develop networks to facilitate the understanding of the market in the Global South, our Connect research has shown that the emphasis should be more at the horizontal networks that define the needs and match them with the solutions. In Kenya, the devolved form of government presents new opportunities that can be used to define and concretise market entry strategies. Working with County Governments creates a direct negotiating inter-face with the local governments, who also happen to have resources as co-investors. However, there are still major technical information gaps that require investment in feasibility studies before concrete business models can emerge.

References

Aderibigbe, N. 2014. Kenya Boosts Power Generation Capacity from Geothermal Well [referenced 8 October 2014]. Available at: http://www.ventures-africa.com/2014/03/kenya-boosts-power-generation-capacity-from-geothermal-well/

AfDB. 2013. Partial Risk Guarantee [referenced 8 October 2014]. Available at: http://www.afdb.org/en/news-and-events/article/adf-partial-risk-guarantee-program-to-stimulate-private-investment-in-the-nigerian-power-sector-12708/

Business Daily Africa. Kenya Plans Shs 200 Billion Expansion of the Energy Grid [referenced 19 October 2014]. Available at: http://www.businessdailyafrica.com/Kenyaplans-Sh200bn-expansion-of-power-grid--/-/539546/1887234/-/4eeftn/-/index.html

Central Bank of Kenya. 2014 [referenced 8 October 2014]. Available at: https://www.centralbank.go.ke/

Finland Futures Research Centre. 2014. Kenya and Tanzania beyond 2015: Exploring Domestic Debates and Envisioning development Futures [referenced 8 October 2014]. Availabe at: http://www.formin.finland.fi/public/download.aspx-?ID=134998&GUID={9B7D3A3D-6B15-42F0-84A6-2F4DD458E90A}

Gacheche K. 2014. Kenya saves Sh9 billion in three months with geothermal energy switch on [referenced 20 November]. Available at: http://www.standardmedia.co.ke/business/article/2000140758/kenya-saves-sh9-billion-in-three-months-with-geothermal-energy-switch-on?pageNo=2

GDC, Geothermal Development Company. 2014. [Referenced 19 October 2014]. Available at: http://www.gdc.co.ke/

Gitonga, A. 2013. Power output to hit 5,000mw in 3 years: Chirchir, Standard [referenced 19 October 2014]. Available at: http://www.standardmedia.co.ke/?articleID=2000089201&story_title=power-output-to-hit-5-000mw-in-3-years-chirchir

Government of Kenya. 2013. Medium Term Plan II (2013-2017) [referenced 19 November 2014]. Available at: http://www.vision2030.go.ke/cms/vds/Second_Medium_Term_Plan_2013_-_20171.pdf

IEA, International Energy Agency. 2014. Africa Energy Outlook [referenced 19 November 2014. Available at: http://www.iea.org/

IMF. 2013. [referenced 19 November 2014]. Available at: http://www.imf.org/external/np/seminars/eng/2013/kenya/pdf/chirchir.pdf

KenGen. 2014 [referenced 19 November 2014]. Available at: www.kengen.co.ke

KPLC. 2014 [referenced 19 November 2014]. Available at: http://www.kplc.co.ke/

Odhiambo, A. 2014. Kenya Plans Shs 200 Billion Expansion of the Energy Grid. Business Daily [referenced 8 October]. Available at: http://www.businessdailyafrica.com/Kenya-plans-Sh200bn-expansion-of-power-grid--/-/539546/1887234/-/4eeftn/-/index.html

Sherelle J. 2014. Electrifying Kenya How One African Country is Approaching Renewable Energy Development [referenced 8 October 2014]. Available at: http://bpva.org.uk/news-details/546.

UNIDO. 2013. UNIDO 2013: World Small Hydropower Report [referenced 19 November 2014]. Available at: http://www.smallhydroworld.org/

South Africa – Improved Understanding for Renewable Energy Potential

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South Africa is the second largest economy in Africa with a GDP of 350 billion USD (2013) and a population of 53 million inhabitants. The GDP per capita is by far the highest in Africa, 5916 USD (2013). (Trading Economics 2014.)

South-Africa is an important global mining industry hub serving both domestic and foreign companies. In 2012, mining provided ZAR 468 billion to the economy. Moreover, mining industry's impact on other sectors (steel, timber, rail etc.) is almost 19% of the GDP in South Africa. Over 16% of the employment in the formal sector is in minig. The share of local content in the exports of mining equipment and specialist services is very high, the estimate is 90 %. (Kumo 2014, 12-13.)

In automotive industry, South Africa is a regional assembly hub, on its way to become a global supplier of components. The impact of the automotive industry on the GDP is over 6% and on the manufacturing exports over 12%. Both retail sector and financial services industry in South Africa are advanced and operate regionally in Africa. (Kumo 2014, 2). South African large banks are amongst the top players on the continent. Retailers are leading the supermarketisation in neighbouring countries. (Kumo 2014, 12 -13.)

Figure 1. Street view from Johannesburg (photo Maarit Virtanen 2014).

Unemployment and labour unrest pose challenges for the country. Almost 25% of the population is unemployed. Furthermore, output potential is constrained by a skills shortage. (Kumo 2014, 2.) Unemployment is polarised by age and ethnicity. Youth unemployment was 51% in the 4th quarter of 2012, compared to 22% for prime-age adults (aged 25-54) and less than 8% for senior workers (55-64). Among Africans the unemployment rate was 28,5% while among Whites it was only 5,5 %. (OECD 2013, 21.) The main reason for unemployment is the gap between the skills needed in the workplace and the skills provided by education. (Kumo 2014, 11-13).

Almost 30 % of the population is under 13 years of age. Primary school attendance is very high. But only 2.8% of black South Africans (18-28 years of age) were studying at tertiary institutions in 2012, while the figure for whites was 17.2%. The World Economic Forum (Global Information Technology Report 2013) ranked South Africa 143rd out of 144 countries for the quality of maths and science education, and 139th for the overall education system. (Kumo 2014, 11).

The Global Competitiveness Report 2013/14 ranked South Africa 45th out of 148 countries in terms of the intensity of local competition, and 8th for the effectiveness of its anti-monopoly policy (Kumo 2014, 8). The perception of corruption has deteriorated in recent years. Transparency International Corruption Perceptions Index (2013) ranks South Africa 72nd out of 177 countries (Kumo 2014, 9).

Figure 2. Street view from Mafikeng, North West Province
(photo Maarit Virtanen 2014.)

Energy shortage remains a problem, renewable energy projects part of solution

In South Africa, large power stations are mainly located in Gauteng province, close to the mines and industries. The transmission lines to coastal areas are long. Coal is the main source of energy, providing about 70% of the country's primary energy and over 90% of its electricity. Eskom is government owned national power utility that generates 96% of the electricity used in South Africa. Eskom owns and controls the national high-voltage transmission grid. Over 40% of Eskom's distribution business comes from direct electricity sales to mines and industry, while about 60% of electricity is distributed directly to customers. Local authorities buy bulk from Eskom and distribute the balance. (Eberhard 2014, 5.)

In 2010, total system capacity in energy production was 44 535 MW and the planned total system capacity in 2030 would be 89 532, more than doubling the capacity in 20 years (Eberhard 2014, 43). South Africa is the largest contributor to carbon dioxide emissions in Africa, and was the 13th largest emitter on global scale in 2009, because of highly energy intensive economy and reliance on coal on energy generation. The long-lasting under-pricing of electricity and coal has enforced the development. (OECD, 2013, 33.)

The pricing of coal well below international levels has contributed to the low electricity prices and explains why 90% of total electricity in South Africa is produced in coal-fired plants. Lately the increase in international coal prices and the demand for South African coal from India have led to increased exports. This has brought up demands that the coal exports should be limited and Eskom should be given preferential access to coal.(OECD, 2013, 33.)

South Africa has committed to reducing its greenhouse gas emissions by 34 % by 2020. There are several national policies supporting low-carbon economy, including the White Paper on Renewable Energy of the Republic of South Africa, Green Economy and Green Economy Accord, and National Development Plan with Green Jobs Programme. (Department of Economic Development, Environment, Conservation and Tourism 2012, 5-8.) National target is 13 % of electricity generation from renewables by 2020 (Irena 2014).

In the White Paper, a target of 10 000 GWh renewable energy contribution to final energy consumption was set by 2013. The Integrated Resource Plan of 2011 stated additional electricity generation capacity need of more than 55 GW by 2030. 42 % of this will be produced with renewable energy. (McNair et al. 2012.) The Independent Power Producer Procurement Programme was launched in 2011 to support the achievement of renewable energy goals. The IPP Programme has a target of 3725 MW for 2010-2030. (Department of Energy 2014.)

Table 1. The Generation capacity allocated for different technologies in IPP Programme (Department of Energy 2014).

Technology	MW
Onshore wind	1 850 MW
Concentrated solar thermal	200 MW
Solar photovoltaic	1 450 MW
Biomass	12,5 MW
Biogas	12,5 MW
Landfill Gas	25 MW
Small hydro	75 MW
Small Projects	100 MW

In 2009, the government launched renewable energy feed-in tariffs (REFITs), but these were later replaced by competitive tenders. According to a World Bank report, the program, known as the Renewable Energy Independent Power Producer Procurement Program (REIPPPP), has successfully channelled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices. 64 projects have been awarded to the private sector, and the first projects are on line. Investment commitments by private sector total US$14 billion. These projects will generate 3922 megawatt (MW) of renewable power. (Eberhard 2014, 1-2.)

Table 2. Summarized results for REIPPPP projects (Eberhard 2014, 14).

	WIND	SOLAR PV	CONCENTRATED SOLAR	HYDRO	BIOMASS	BIOGAS	LANDFILL	TOTAL
Capacity awarded (MW)	1984	1484	400	14	16	0	18	3915
Projects awarded	32	23	5	2	1	0	1	64
Total investment (ZAR mill)	40590	42130	33797	631	1061	0	288	120263
Total investment (USD mill)	4683	5085	3806	79	108	0	29	14011

There are some key lessons to be learnt from the South African experience to succeed in renewable energy programs including (Eberhard 2014, 3):

- private sponsors and financiers are more than willing to invest in renewable energy if the procurement process is well designed and transparent, transactions have reasonable levels of profitability, and key risks are mitigated by government
- renewable energy costs are falling and technologies such as wind turbines are becoming competitive with alternatives
- renewable energy procurement programs have the potential to leverage local social and economic development
- need for effective program champions with the credibility to interact convincingly with senior government officials, effectively explain the program to stakeholders, and communicate and negotiate with the private sector
- whether a feed-in-tariff or competitive tender is chosen, private sector project developers need a clear procurement framework within which to invest

Prominent equity players in the three REIPPPP bid rounds have been, for example, the insurance company Old Mutual, Standard Bank of South Africa and the Industrial Development Corporation, Africa Infrastructure Investment Fund, and sponsors such as Mainstream, Mulilo, and Thebe. Also an Italian utility, Enel Green Power, was prominent in Round 3. (Eberhard 2014, 19 -22.).

Approximately two-thirds of REIPPP project funding has been debt, 25 % has been funded from pure equity and shareholder loans, with the remaining from corporate finance. The majority (64%) of debt funding has been from commercial banks and pension and insurance funds. 86% percent of debt has been raised from within South Africa. The five large South African commercial banks – Standard, Nedbank, ABSA, RMB, and Investec – have dominated REIPPPP lending. (Eberhard 2014, 19 -22.).

Forty-nine EPC contractors have been involved in the 64 projects during the first three rounds of REIPPPP, The main suppliers of wind turbines and PV equipment have been Vestas, Siemens, Nordex, ABB, Guodian, and Suzlon - mainly European companies with a Chinese and an Indian company. Main PV suppliers have been Siemens, SMA Solar Tech, BYD Shanghai, Hanwha Solar, 3 Sun, AEG and ABB - European, Chinese, and Korean manufacturers. A local manufacturing facility, DCD Wind Towers, has been established at the Coega Industrial Development Zone in the Eastern Cape. At least five PV panel assembly plants have been set up in South Africa during the last years. Some of international suppliers have used these to achieve localization targets. (Eberhard 2014, 19 -22.)

The Small Scale Projects IPP Tender was launched in August 2013, aimed at projects of 1 to 5 MW of installed capacity. However, the South African commercial banking sector lacks the incentives to support these smaller projects. Higher equity requirements or higher debt margins may be required

from smaller sponsors, who do not have the bargaining power needed to negotiate cost-effective contracts or the experience to mitigate completion and performance risks. For many South African banks, these kinds of sponsor risks make smaller projects commercially not viable or not worth due diligence costs. (Eberhard 2014, 36.)

Biofuel production in South Africa is supported by legislation on mandatory blending of petrol and diesel with biofuels from 1 October 2015. The aim of this five-year pilot phase is to achieve a 2 % biofuels penetration into the national liquid fuels pool. Biofuels include both bioethanol and biodiesel produced from crops and vegetable oils. The staple food crop maize is excluded from the program. (South Africa.info 2013.) A challenge with biofuels is the testing of fuels, because there are yet know certified laboratories for this in South Africa. The price of testing can also be high for small producers.

Figure 3. Biofuel testing equipment at Nelson Mandela Metropolitan University (photo Maarit Virtanen 2014).

Case Provinces in South Africa

Gauteng Province

The Gauteng Province is the largest contributor to the South African GDP with the share of almost 35%. The province is clearly the economic growth hub of the country. The largest employment sectors are wholesale, community services, financing and manufacturing. As one of the economically most advanced provinces, Gauteng is experiencing rapid population growth through inter-provincial migration. The province has the most favourable dependency ratios in the country, but the population growth also causes sustainability problems related to congestion and use of resources. Gauteng has also experienced increasing unemployment especially among the youth. (Development Bank of Southern Africa 2014.)

Gauteng Integrated Energy Strategy has a vision of: "A Gauteng province that is powered by a low carbon economy with a significant share of national "green jobs", and accessible and affordable energy services that do not impact on the health of people or the environment" (Gauteng Integrated Energy Strategy 2012). The aims of Strategy include shifting to a low carbon economy, maximizing the use of local energy resources and development of the renewable energy industry as an employment creation opportunity. Identified challenges include the capacity of smaller municipalities, heavy reliance on non-renewable energy, lack of viable energy alternatives and deepening poverty and inequality. (Ibid. 2012.)

The goal of Gauteng Province is to obtain 7 % of its electricity from renewable sources by 2014, and 16 % by 2025. The initiatives to reach the goal include a Solar Electrification Project for households by Gauteng Government. The solar energy installations have potential to create employment and contribute to Gauteng's Green Economy. (The Innovation Hub, no date.) Another example of initiatives is rollout for renewable energy in buildings, including rooftop solar PV for government offices and energy efficient technologies (KZN Energy 2013).

Figure 4. Johannesburg, Gauteng Province (photo Maarit Virtanen 2014).

Eastern Cape Province

According to the Eastern Cape Development Corporation, the Eastern Cape is described as straddling two worlds: one of severe underdevelopment and one of modern, growing industry. The Province has introduced different programmes and strategies to address underdevelopment, and developed an export-oriented industry based on manufactured goods. The Eastern Cape manufactures half of South Africa's passenger vehicles and provides 51 % of country's vehicle exports. Four Original Equipment Manufacturers are located in the Province along with approximately 100 major component manufactures. (ECDC 2014a.)

The Eastern Cape Government is committed to increasing the share of renewable energy to 2 % of energy used in the province by year 2025 (ECDC 2014b). The Province has a Sustainable Energy Strategy with a vision that the Eastern Cape provides the most enabling environment for sustainable energy investment and implementation in the country. The aim is, among other things, to provide an enabling environment for municipalities to purchase renewable energy, and for companies to attract investment. (Province of the Eastern Cape 2012, 6.)

Renewable energy projects in the Eastern Cape include the Jeffrey's Bay Wind Farm spanning 3700 hectares with 60 wind turbines. The project reached commercial operations in mid-2014 and supplies 460 000 MWh per year. (Jeffrey's Bay Wind Farm 2014.) The Kalkbult solar farm, the largest in South Africa, is located in Karoo desert. The 75 MW plant was commissioned by Norwegian-based Scatec Solar and its local partners, and it consists of 312 000 solar panels, covering 105 hectares. (Scatec Solar 2014.) AsgiSA Eastern Cape assists the government with development of eastern areas of the Province and has a programme on introducing 1500 MW of renewable energy, including hydropower projects (AsgiSA 2014).

The Nelson Mandela Bay Metro Municipality and the Danish Government have a partnership to provide solar-powered geysers to low cost housing in the municipal area. In the NMBM Go Green Initiative, the Zanemvula settlement was identified as an ideal location for a project of this kind. More than a thousand solar water heaters have been installed. The Zanemvula project will aid future large scale rollouts of solar water heaters at a national level. The NMBM Go Green Initiative was a response to Eskom's proposed Power Conservation Programme, which aims at reducing demand-side consumption levels. (eSeed 2010-05.)

Figure 5. Dr. Freddie Vorster presenting solar PV testing at Nelson Mandela Metropolitan University, Eastern Cape (photo Maarit Virtanen 2014).

North West Province

The North West Province is also known as the Platinum Province, and it is one of the largest producers of platinum and its related metals worldwide. The province is the largest contributor to South Africa's mining sector. Other main economic sectors include manufacturing, agriculture and agribusiness, financial services and trade. (Invest North West 2014.) Because of energy intensive mining and related industrial sectors, the North West is the fourth largest electricity consuming province in South Africa. Approximately 63 % of electricity supplied to the Province is consumed by the mining sector. (Department of Economic Development, Environment, Conservation and Tourism 2012, ii.)

Despite the large mining sector, The North West Province faces challenges with poverty, high unemployment and inequality, as well as a growing informal sector. About 65% of population live in rural areas, and the province has substantial service delivery backlogs in housing and electrification. (Department of Economic Development, Environment, Conservation and Tourism 2012, 2.) Renewable energy is promoted especially for rural electrification with the aim of creating a strong localised renewable energy industry that holds substantial potential for black economic empowerment and job creation (ibid, 25).

The renewable energy focus areas that have been identified in the North West province are: solar water heating, clean cook stoves, energy efficiency and energy service companies (ESCO), municipal solid waste, solar photovoltaic technologies, cogeneration and waste heat recovery, and hydrogen and fuel cell technologies (Department of Economic Development, Environment, Conservation and Tourism 2012, 54).

Case Rustenburg – On a Long Road to Carbon Neutrality

The city of Rustenburg is located in the North West Province within Bojanala Platinum District Municipality. Population is estimated to be around 555 000 distributed in 38 wards. Although Rustenburg has significant tourism and agricultural activity as well as variety of local manufacturing and distribution companies, mining remains the key economic sector. Rustenburg houses two of the world's biggest platinum mines and the largest platinum refinery. In fact, 70% of the world's platinum originates from the area. (Sebadi Environmental and Social Services 2013d, 17 & 42.)

Rustenburg Local Municipality has recently revised its Climate Change Management Plan and GHG Inventory to identify key mitigation sectors and to recommend adaptation measures for the municipality (Sebadi Environmental and Social Services 2013a, 4). The strategic aim set by the municipality is to reduce greenhouse gas emissions by 16% from the 2011/12 level by the year 2035 and to work towards attainment of carbon neutrality (Sebadi Environmental and Social Services 2013b, 149).

According to the greenhouse gas emissions inventory, the greenhouse gas emissions in Rustenburg were 144,716,386 tons CO2 e/annum in the year 2012/13. GHG Inventory was conducted based on the two Local Government GHG Emissions Analysis Protocols developed by ICLEI and provides insight on the emissions from the sectors such as energy use, transportation, waste, industry, agriculture as well as emissions from the municipalities own buildings and structures. (Sebadi Environmental and Social Services 2013c, 103.)

Energy (including transportation) and industrial processes have been identified as key mitigation sectors for the communities of Rustenburg. The main type of energy used in Rustenburg is electricity and paraffin/gas. Still, in rural areas of the municipality, the share of wood and coal is 45%. (Sebadi Environmental and Social Services 2013d, 39). All in all, the challenges and emission sources are different in urban and rural areas. To give an example, in rural areas, lack of waste collection services causes 37% of the waste to be burned (Sebadi Environmental and Social Services 2013d, 53).

The climate change mitigation strategy outlines that Rustenburg will strive to establish policies and programs that maximize private, community and public investment in renewable energy and energy efficiency. The intention is also to promote innovation and clean energy technologies and to develop a supportive environment for new business development in the clean energy technology sector. The action plan entails efforts to substantially increase energy efficiency and reduce GHG emissions in the municipalities own operations and communities. (Sebadi Environmental and Social Services 2013b, 149.)

North-South Local Government Cooperation between city of Lahti and Rustenburg local municipality is striving to support the implementation of the climate change strategy in 2015-2017 by building capacity in the municipality. The focus of expertise exchange will be on renewable energy, town planning, clean technology business opportunities and practical implementation of energy efficiency programs. As a first step in improving energy efficiency, Rustenburg is officially launching a “Green Office” program for municipal offices in November 2014.

Connect Project Activities in South-Africa

During the Connect project, network creation to South-Africa has been studied, focusing on possibilities created through university collaboration. Contacts were initiated with six universities, both existing partners and new contacts in four regions: Gauteng, North West, Eastern Cape and Western Cape. All six universities were visited and project possibilities discussed either in meetings or in workshops. The technology manager Ronelle Potgieter from InnoVenton Research Institute at Nelson Mandela Metropolitan University in Port Elizabeth subsequently visited Finland and several Connect project company partners in the solar and bioenergy sectors. She also held a presentation on South Africa at the final seminar of Connect project. The collaboration has so far resulted in some company enquiries.

The main areas of involvement in South Africa were identified as solar (PV cells and collectors) and biogas. Most areas in South Africa average more than 2 500 hours of sunshine per year, and average solar radiation levels range between 4.5 and 6.5kWh/m2 in one day. Solar applications in renewable energy technologies are grossly underutilized. Solar radiation information is available online through The Southern African Universities Radiometric Network (SAURAN). SAURAN stations provide high-resolution, ground-based solar radiometric data. Measurement data can be downloaded free of charge. (SAURAN 2014.)

Another renewable energy source not tapped in South Africa is biogas. Finnish solutions that enable generation of biogas from various sources, ranging from general household waste to specific agricultural waste, could be applicable to South Africa. The scale of biogas operations in Finland is not available in South Africa, even though the country has large amounts of biomass waste that can be used. For instance, in and around Port Elizabeth are numerous dairy farms and food industries that can benefit from biogas production.

The unique characteristics of technology available in Finland have been identified during a visit of Ronelle Potgieter to several Finnish companies. The following was identified:

- High technology base – The renewable energy technology developed and applied in Finland is of a very high standard, based on sound research and development. This is an attractive feature to the South African market. Cheap and inferior products (specifically solar water collectors) have been installed on government sponsored housing to dire effect.
- Quality driven – The quality of products is of a very high standard. Quality systems are in place and people take pride in their work. Production lines are built with quality in mine. The quality is fit for purpose. This has to be taken into consideration when dealing with South Africa – the temperature ranges are not as severe as in Finland. In most parts of the country the mercury level does not drop below 5°C in winter, however, it can reach 40+°C in summer.
- Environmental and safety conscious – technologies developed in Finland are both safe and environmentally sound. This is an attractive feature to South African companies.
- Automation – Finns are masters in automation, which is both advantageous and not. Due to the very high unemployment in South Africa governments in general will not support technologies that are over automated, since it could have provided employment to people. This, however, is very attractive to the industries in South Africa, which are moving towards increasing automation due to the labour unrest in the country.
- Considerate – people are considerate in Finland and interest is there to build long term relationships. This is the way of business in South Africa as well, especially in the private sector.

From the point of view of Nelson Mandela Metropolitan University, collaboration between South Africa and Finnish Universities will benefit the students and industries from both countries tremendously. Exchange of students will add to student's experience of other cultures and societies. Hands-on experience will be invaluable to the students. On a technological field, exposure to various conditions in the environment and industry will enhance student's perception of the conditions that a certain technology must be able to perform (i.e. very cold climate in Finland versus hot and humid in South Africa). Current projects exist where students and staff can be involved in various aspects of the research and development, and collaboration on an international level is definitely promising.

During the Connect project, cooperation has also been strengthened with the North West University (NWU). Lahti University of Applied Sciences has cooperated with NWU on student exchange, and the students visiting Finland have also participated in the Connect project. The aim is, however, to broaden the scope of cooperation to research with FUAS partners. The focus of cooperation identified during the project is on waste to wealth; developing waste management, reuse, recycling and waste-to-energy solutions. The activities are connected to the City of Lahti long-term municipal cooperation with Rustenburg and Madibeng in the North West Province. Collaboration between NWU, Rustenburg municipality and FUAS was discussed at a project preparation workshop in Rustenburg in November 2014, and several areas of common interest were identified.

Figure 6. The new Waterval General Waste Disposal Facility in Rustenburg (photo Maarit Virtanen 2014).

City Twinning Provides Insight into the African Clean Technology Markets

City of Lahti has been involved in the North South Local Government Cooperation program since 2002. The program is coordinated by the Association of Finnish Local and Regional Authorities and funded by the Ministry for Foreign Affairs. Through the program, Lahti and its local government partners in South Africa and Ghana have received funding for capacity building in the environmental administration. In South Africa, Lahti is cooperating with Rustenburg and Madibeng local municipalities that are situated approximately 100 kilometres from Johannesburg in North West Province. The area is known as a hub of tourism and mining industry, especially platinum mining. In Ghana, Lahti has partnered with the capital of Volta Region, Ho Municipality. The economy of Ho is highly dependent on small-scale agriculture.

In 2013-2014, the cooperation between Lahti, Rustenburg, Madibeng and Ho has focused on the development of municipal solid waste management and sanitation coverage. With the support of the cooperation, South African partners have piloted source separation operations and capacitated community-based groups to start recycling and material recovery ventures. In Ghana, feasibility of dry toilet technology and composting have been studied in course of school and community pilots. Peer reviews, trainings, exchange visits and benchmarking activities enable the sharing of best practices between Northern and Southern colleagues. Furthermore, co-creation of new service delivery solutions for identified challenges is carried out through research pilots and studies.

For stakeholders in Lahti, such as the Lahti University of Applied Sciences (Lahti UAS), the project provides valuable insight and contacts to the progressing African environmental technology markets. Understanding the stakeholders, challenges, needs and priorities of the South African and Ghanaian environmental and local government sectors makes it possible to evaluate the potential of Finnish environmental technology solutions for these markets. The environmental engineering degree program of Lahti UAS has been involved in the planning and implementation of research pilots, e.g. through course works, final theses and student work placement. This R&D approach will be strengthened from 2015 onwards when Lahti UAS is coordinating the cooperation in Lahti. (Aalto 2014.)

Discussion

The university cooperation between FUAS and South African partners has shown good possibilities for long-term partnerships on research and development. Universities have a natural role in knowledge transfer, capacity building and awareness raising activities with local partners like municipalities and companies. In Finland, regional development is one of main focus areas for universities of applied sciences and they have strong experience on cooperation with local stakeholders.

In South Africa, there is local expertise especially on solar and wind solutions. For example, Nelson Mandela Metropolitan University has a Centre for Energy Research, and there are several renewable energy companies. There is, however, interest in further developing solutions like small-scale wind power.

Bioenergy is not utilised in South Africa, and this is one area, where collaboration on product development to adapt solutions to local conditions can be fruitful. The collaboration initiated within Connect project continues with joint project planning supported by student and teacher exchange.

References

Aalto, A. 2014. North South Co-operation of Lahti Aims to Turn African Waste to Value. Journal of Finnish Universities of Applied Sciences, No 3 (2014) [referenced 6 November 2014.] Available at: http://uasjournal.fi/index.php/uasj/article/view/1610/1534.

AsgiSA. 2014. Hydropower & Alternate Energy [referenced 21 October 2014]. Available at: http://www.asgisa-ec.co.za/hydropower.html

Department of Economic Development, Environment, Conservation and Tourism. 2012. Draft Renewable Energy Strategy for the North West Province.

Department of Energy. Republic of South Africa. 2014. Renewable Energy Independent Power Producer Procurement Programme [referenced 27 October 2014.] Available at: http://www.ipprenewables.co.za/#page/303

Development Bank of Southern Africa. 2014. Gauteng Profile Summary Report [referenced 27 October 2014]. Available at: http://www.dbsa.org/en/DBSA-Operations/Proj/Documents/Summary%20of%20Gauteng%20Province.pdf

Eberhard, Anton, Kolker, Joel & Leigland, James, 2014. South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons. May 2014. WBIRP Africa Report No: ACS8826 Republic of South Africa. Review of the South Africa Renewable Energy IPP Process. Public-Private Infrastructure Advisory Facility (PPIAF) 2014 [referenced 14 October 2014.] Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/07/08/000333037_20140708143204/Rendered/PDF/ACS88260WP0P1482120Box385262B00PUBLIC0.pdf

ECDC. Eastern Cape Development Corporation. 2014a. The Eastern Cape Economy [referenced 21 October 2014]. Available at: http://www.ecdc.co.za/ecdc/about_the_eastern_cape/economy.

ECDC. Eastern Cape Development Corporation. 2014b. The Eastern Cape Economy [referenced 21 October 2014]. Available at: http://www.ecdc.co.za/ecdc/sectors_and_industries/renewable_energy

eSeed 2010-05. No date [referenced 10 Nov 2014.] Available at: www.sustainable.org.za

Gauteng Integrated Energy Strategy. 2012. Presentation at Energy Planning Colloquium 29 – 30 March 2012. Mokomane Mekgoe, South Africa.

The Innovation Hub. No date. Gauteng government launches Solar Electricification project [referenced 27 October 2014.] Available at: http://www.theinnovationhub.com/index.php?option=com_content&view=article&id=120:gauteng-government-launches-solar-electricification-project&catid=11:media-releases&Itemid=162

Invest North West. 2014. North West Economy [referenced 14 October 2014]. Available at: http://inw.org.za/north-west-economy/38/

Irena. 2014. Renewable Energy Country Profile [referenced 27 October 2014.] Available at: http://www.irena.org/REmaps/countryprofiles/africa/southafrica.pdf#zoom=75

Jeffrey's Bay Wind Farm. 2014. About Jeffrey's Bay Wind Farm [referenced 21 October 2014]. Available at: http://jeffreysbaywindfarm.co.za/

KZN Energy. 2013. RFI: Rollout of Renewable Energy Solutions for Building by Gauteng Province – Due 02 August [referenced 27 October 2014.] Available at: http://www.kznenergy.org.za/rfi-rollout-of-renewable-energy-solutions-for-building-by-gauteng-province-due-02-august/

Kumo, Wolassa Lawisso, Rieländer Jan & Omilola, Babatunde, 2014. South Africa 2014. African Economic Outlook. AfDP, OECD, UNDP [referenced 14 October 2014.] Available at: http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Afrique_du_Sud_EN.pdf

McNair, D., Dodd. A. and Piper, D. 2012. South Africa's REIPP: Lessons to-Date [referenced 27 October 2014.] Available at: http://www.dlapiper.com/~/media/Files/Insights/Publications/2012/12/South%20Africas%20Renewable%20Energy%20Independent%20Power__/Files/pfisouthafricasreipp/FileAttachment/pfisouthafricasreipp.pdf

OECD, 2013. OECD Economic Surveys. South Africa. Overview. March 2013 [referenced 14 October 2014.] Available at: http://www.oecd.org/eco/surveys/South%20Africa%202013%20Overview%20FINAL.pdf

Province of the Eastern Cape. 2012. The Eastern Cape Sustainable Energy Strategy: Executive Summary. An Eastern Cape Department of Economic Development, Environmental Affairs and Tourism Publication.

Purfield, Catriona Mary; Farole, Thomas; Im, Fernando. 2014. South Africa Economic Update: Focus on Export Competitiveness. The International Bank for Reconstruction and Development/THE WORLD BANK, 2014 [referenced 14 October 2014.] Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/02/03/000333037_20140203120030/Rendered/PDF/843690NWP0P13100SAEU50for0web-0final.pdf

SAURAN. 2014. Southern African Universities Radiometric Network [referenced 11 November 2014.] Available at: http://www.sauran.net/

Sebadi Environmental and Social Services, 2013a. RLM Climate Change Management Plan and GHG Inventory – Final Report 2013. Prepared for Rustenburg Local Municipality. Published 27 June 2013.

Sebadi Environmental and Social Services, 2013b. RLM Climate Change Management Plan and GHG Inventory – Revised Climate Change Strategy. Prepared for Rustenburg Local Municipality. Published 27 June 2013.

Sebadi Environmental and Social Services, 2013c. RLM Climate Change Management Plan and GHG Inventory – Revised Greenhouse Gas (GHG) Inventory. Prepared for Rustenburg Local Municipality. Published 27 June 2013.

Sebadi Environmental and Social Services, 2013d. RLM Climate Change Management Plan and GHG Inventory – Revised Status Quo Report. Prepared for Rustenburg Local Municipality. Published 27 June 2013.

Scatec Solar. 2014. Kalkbult, South Africa, 75 MW [referenced 21 October 2014]. Available at: http://www.scatecsolar.com/Business/South-Africa/Kalkbult-South-Africa-75-MW

SouthAfrica.info. 2013. SA to Blend Biofuels from 2015 [referenced 18 November 2014.] Available at: http://www.southafrica.info/business/trends/newbusiness/biofuels-011013.htm#.VGHGwLU8Jdg

Trading Economics, 2014. South Africa: Economic Indicators [referenced 6November 2014.] Available at: http://www.tradingeconomics.com/south-africa/indicators

World Bank 2010. Getting Electricity. A pilot indicator set from the Doing Business project. The International Bank for Reconstruction and Development / The World Bank [referenced 3 November 2014.] Available at: http://www.doingbusiness.org/~/media/FPDKM/Doing%20Business/Documents/Special-Reports/Getting-Electricity-Pilot-Indicator-Project.pdf

World Bank. 2013. Doing Business 2014: Understanding Regulations for Small and Medium-Size Enterprises. Washington, DC: World Bank Group. DOI: 10.1596/978-0-8213-9615-5. License: Creative Commons Attribution CC BY 3.0.

World Bank. 2014. Doing Business 2015: Going Beyond Efficiency. Economy Profile 2015, South Africa Washington, DC: World Bank Group. DOI: 10.1596/978-1-4648-0351-2. License: Creative Commons Attribution CC BY 3.0 IGO [referenced 3 November 2014.] Available at: http://www.doingbusiness.org/data/exploreeconomies/south-africa/~/media/giawb/doing%20business/documents/profiles/country/ZAF.pdf?ver=2

International Students as the Tool for Renewable Energy Market-Entry in Africa – story of Connect Consulting Cooperative

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The very core of the Connect project was to utilise the undervalued and untapped expertise of international students and international alumni. The Federation of Universities of Applied Sciences, Finland (FUAS) has more than 1600 degree students from all over the world (Study portals 2014). Among these students, almost all African countries are represented. The cultural knowledge and insight to the societies are such assets that only locals can have. In the Connect project, involvement of students helped finding needed information when doing baseline studies and creating understanding of local markets and their dynamics. Towards the end of the project, students realised the potential of their knowledge, and established a company, which now is serving SMSs establishing markets to the developing economies in Africa.

For Finnish companies, African countries are rather unknown, and understanding on how culture influences business operations is limited. Foreign students represented over 2% of the entire students' population in upper secondary, vocation schools, polytechnics, and universities in Finland in 2012 (Statistics Finland 2012). These students are viable, under-utilized and abundant assets in the Finnish society which can transform the way Finnish international businesses are conducted. The international students and alumni have become crucial members of Connect project immediately after the project started in January 2012. At first, their involvement was limited to academic exercises; relevant information regarding the initial target renewable energy (RE) markets was produced. Later on, they became interested in RE business, and established the Connect Consulting Cooperative (Henceforth referred to as CC Coop).

The foreign students and alumni can have multiple roles when acting as intermediaries between the markets and the SMEs. They understand the socioeconomic culture of both Finland and African countries. They have zeal for energy marketing, they are able to bridge the gap between the Finnish and African markets and they are able to pollinate both markets with the needed and necessary ideas. Consciously and naturally, international students have acquired two very important tools in international business - intercultural communication and experience in multicultural environment. "Another major area of required skills has to do with intercultural communication and this is definitely where international students and graduates are at their strongest" (University of Helsinki Career services 2014, 6).

Students' and graduates' involvement in Connect project was in two interwoven categories – "unstructured research team" and "Connect Consulting Cooperative". The unstructured research team (UR Team) comprised mainly of students from HAMK, Laurea and Lahti Universities of Applied Sciences, Finland and exchange students from partner universities, mostly from Africa. Some of the students were in their final year of studies. The research team was considered unstructured because it was not officially commissioned as a research team but it was a combination of separately working individuals and/or groups from, and affiliated with the three Connect project's universities.

The UR team's work started with business analysis of the initial ten target countries. The results from these analyses helped the Connect project team to narrow down the target countries from ten to three – Kenya, Nigeria and South Africa. However, students' research work was not confined to the three countries, but other countries were still being explored based on student's or Finnish companies' preference.

Further research work was carried out either as group works and student projects or as individual final theses. The research done includes country analyses, industry analyses and operating environments of Botswana, Cameroon, Ghana, Kenya, Namibia, Nepal, Nigeria, South Africa, Tanzania, Uganda, and Vietnam; business opportunities, market viability, renewable energy market entry, RE usability, production feasibility and project studies, finance, policies, and RE Social acceptance in target countries, as well as issues on waste management and on waste to energy or wealth. Altogether 21 Bachelor's and Master's thesis related to the project have been finalised at the time of writing and 5 more are forthcoming.

CC Coop is a Connect project's supported enterprise established by international students and experts living in Finland. CC Coop is a renewable energy market-entry company which combines theory with practice to achieve successful market-entry and reliable business networks for clients. It acts as a bridge-builder between Finnish RE SMEs and African RE markets. The company is poised to act as a one-stop shop for both Finnish RE SMEs and RE clients and customers in Africa. It has a sole aim of promoting Finnish renewable energy and allied technologies in Africa. Not only does CC Coop identify business opportunities in Africa for Finnish companies, but also analyses target markets prior to entry. The company also match-makes Finnish RE companies with competent and valuable local and international partners for project planning and execution.

Figure 1. Connect Consulting Cooperative members at project seminar (photo Päivi Kärnä 2014).

CC Coop is a variant of workers' self-directed enterprises (WSDE) which gained popularity through the work of a renowned heterodox economics, Prof. Richard Wolff. WSDE allows workers to make decisions which directly affect them. Also, those who are directly involved in "producing outputs and those providing the support services enabling production are collectively the directors deciding what, where, and how to produce and how to distribute the appropriated surpluses" (Wolff 2012, 171). CC Coop is completely independent of the project universities but relies on them for intellectual support at no cost to the company; members of the universities also act as mentors and advisers for the young entrepreneurs.

The idea of setting up CC Coop emanated from the activities of the UR team and mentorship advices from Peter Kuria and Kristiina Ranta, who currently act as coaches for the company. At first, the CC Coop members were only interested in the academic part of the Connect project but understood through Finnish RE SMEs' analyses and advice from Peter Kuria the possibilities of creating a flexible and less-bureaucratic company. Many Finnish RE and allied products companies have been contacted.

Prior to this time, it was gathered that Finnish RE companies had made several attempts to get a share of the booming and emerging African RE markets but have met with little or no success. It then became clear that an organization which can complementarily unite Finnish RE technologies was needed to enable market-entry for Finnish companies. The founding partners comprising 5 individuals from Cameroon, Finland, Kenya, and Nigeria were attracted to work together based on their diversities in terms of expertise, language skills, country of origin, experience, networks etc. More information on partners' background, experience and expertise is available on: http://www.connnectconsultos.com/

Meetings, seminars and direct discussions with some Finnish and African renewable energy SMEs revealed the common interests and willingness that both sets of companies have in terms of promoting RE technologies in Africa. However, there were contrasting views on how the market is perceived, involvement strategies and parties' expectations.

The following section of the article will focus on the findings of CC Coop to explain the issues that seem to be the challenges for the Finnish SMEs in entering the African market. The section will also explain how CC Coop is able to facilitate and smoothen the process of placing the right product on the right market.

Knowledge of the business environment

Every entrepreneur aspiring to enter a new market wants to know and understand the factors external to it which determine and/or control her failure or success in that new market (National Technical Working Group 2009, 7). This is because the new market's culture will be different from what she is used to and how she had operated in her home country.

Also, an entrepreneur's interest which might eventually result into the decision to enter a new market is usually aroused by her perception of the opportunities in this new market (Robinson 2005, 46). Many Finnish companies do not want to risk jumping into a country, if they do not understand how things are done, what the business practices are, what influence the government has on businesses, the prevailing business culture, the trust level that should be bestowed on potential business partners or customers, the market opportunities available and how to survive in turbulent situations.

Individualism and low popularity in the global south

Most Finnish companies, regardless of their size, products, current customer base, economic situation etc, are interested in going abroad. They might have made an attempt at one point or the other or have been contacted by a potential client/customer from another country. Unfortunately, one reason for their unsuccessful RE market-entry to other countries, especially the developing countries is because they lack the adequate market-entry thrust and also, Finland is largely unknown in the global south (Lewis 2004, 16).

Market-entry thrust in the context of this study, is the minimum adequate resources and capability needed to successfully overcome existing market forces in a new market thereby reaching a profitable business deal. This seems not to be easy for many small Finnish companies which are mostly family own and may be sole proprietor or few employees running the business. They have little resources; even if and when orders are placed, they may not be able to profitably fulfil these orders in such a way that they can overcome the market forces in most African markets. Their prices would be too high for prospective consumers; after-sales services may be non-existent; they may lack the ability

to provide holistic RE solution etc. CC Coop is therefore able to help Finnish RE companies collaboratively and complementarily combine their individual synergy to form an adequate market-entry thrust to break-even into the African markets. This would be done by analysing the different value streams of RE companies and then, designing a new value stream which brings together their core competences, technologies and products. CC Coop is also able to help clients recruit local resources at low cost to accomplish certain task or assemble tailor-made final products affordable for African customers.

Unsure about African's purchasing power

For every company aspiring to enter a new market, profit-making represents a critical criterion to consider. "The attractiveness of a country as a potential market for an international business depends on the balance of costs, benefits and risks" (Mlozi, 2013). These costs and benefits would result in company's profit for doing business in this new location, which is a function of the purchasing power or present wealth of the population. So, a company going into an unknown market needs to be sure that the present wealth of the potential client is adequately enough to bring the expected return on investment. For instance, in one meeting, a Finnish portable solar products company's representative believed that his product was unaffordable in developing countries such as Kenya and Nigeria. CC Coop can help Finnish companies determine the level of affordability for certain products in a particular African country. This would be done using both simple and complex market-analysis tools ranging from personal contact to survey to product's test marketing.

Existing competition

Even in cases where the company believes in the present purchasing power of the potential customers, the existing competition becomes one of the major stumbling blocks on the path of the company. Most Finnish RE SMEs feel that they do not have the ability to compete with the existing big Chinese corporations, the German-government backed German companies or the Obama-Administration funded US conglomerates. One thing is to know competitors are out there; another thing is to understand the strength and weakness of competitors. CC Coop is able to help companies analyse the existing competition in their target African market. Knowing competitors' abilities and inabilities would help a new entrant prepare towards achieving maximum success in that particular market.

Opportunity costs

In order to facilitate business collaboration between Finnish RE SMEs and their African counterparts, several business networking seminars in Kenya and Nigeria were proposed but none of these efforts yielded success. One major reason for the Finnish companies' cold shoulder towards the business networking seminars was fear of loss of other opportunities in Europe if they

embark on this kind of visit to Kenya or Nigeria. This is a key area where CC Coop can be of help to Finnish RE SMEs. CC Coop can be the single entity which would represent the non-competing interests of Finnish RE SMEs in such a distant pre-market entry visits or business networking seminars. This would allow the SMEs to focus on their local operations while their companies are still being promoted in distant countries. In so doing, they can save time, effort and money.

Far away land mind-set

"Africa is a far - away land for most of us". This is the basic mind-set of most small Finnish companies. They would prefer to do business within Finland or in nearby countries or countries they are very familiar with. It is understandable that they do not have the necessary resources to access these markets; they are not willing to take risks and so they think it would be difficult to cope with the complexities in these markets. CC Coop was founded and is being operated by graduates and experts who are mostly from these "far-away lands" or who know or can easily make contacts with people living in these "far-way lands". So, CC Coop can help Finnish companies to understand the true situation in these countries.

Corruption stigma

Corruption is one thing every Finnish company and citizen tries as much as possible to disassociate from. It was not surprising that Finland was rated by Transparency international as the top least corrupt country in 2012 and the third least corrupt in 2013 (Yleisradio, 2013). Unfortunately, in many developing countries, "corruption is endemic and pervades every aspects of life, including every strata of the society; the manifestations have become so mutative that it has defied various initiatives and strategies aimed at arresting it (Osifo 2012, 71)" This is one major reason why so many Finnish businessmen are weary of conducting business in developing countries; they are scared of engaging in corrupt practices. Here again, international student and alumni can provide valuable cultural knowledge on how to deal with different situations. CC Coop is ready to assist the African companies as well. The following section of the article will highlight the possibilities with the Global South.

Access to capital

Even though there are many financial institutions in Africa, finance is one of the greatest challenges that new and small companies face. They do not have access to credit facilities (Larossi 2009, 21). Equity investment is also non-existent and debt capital comes with throat-cutting interest rates. None of the African companies contacted was confident of adequate financial base to execute renewable energy projects when and if they got one. A major complaint is that the big foreign companies are able to meet demands from RE consumers whilst it is difficult for many African RE SMEs to compete with

them, because they lack adequate funds. Often the problem is that companies do not have adequate information as to where these funds can be located. Most business owners in the global south have limited access to information; this may be sometimes due to low internet penetration and low access to electricity, making information sourcing more difficult for dwellers in the global south than the north. CC Coop with members having unlimited access to information can help African businessmen in analysing and educating them on the different financial options available.

Market competition

According to many African RE SMEs, the market is currently being dominated by the Chinese and the Germans while the US companies are currently making aggressive attempts to take over the market, leaving little or no room for the upcoming indigenous SMEs. These giant foreign companies are well funded and are able to get large projects from the government and large institutions. The local RE SMEs are not financially and technically capable to compete with these big firms. CC Coop can help African RE businesses by collaborating with Finnish companies to organize necessary need-to-know technical training and technology transfer practices to their potential African partners.

Consumers' perception

According to one Nigerian RE company's representative, "there are too many substandard products out there, the solar products have failed people, and people no longer trust the quality of the products". Another company representative pointed out substandard batteries as one of the major stumbling blocks in successfully marketing solar products. This has affected consumers' confidence in solar products. To worsen the situation, many RE products have been tag with the "made in China" sigma which is rooted in brand distrust and perception of substandard among consumers (Beattie 2013). Colloquially in Nigeria, the term 'Chinko made' which literarily refers to "Chinese made" denotes fake products. Many RE products have lost the social acceptance required to make people want to spend more than their current energy expenditure for RE products.

Finnish RE products still stand better chance of gaining ground on the African market. This is because Nokia phones proved that Finnish products are of superior quality. This gave the country of origin a good image that can be utilised in marketing.

"Foreign Aid" syndrome

Whenever most African RE companies were contacted, a positive response was expected regardless whether or not the company deals in or is knowledgeable about the RE products in question. The reason for this was because they erroneously saw this as foreign opportunity/help coming their way. The mentality most of the time is that "it would be great if the Finnish companies

can come to help us". At one time, a potential partner company representative said: "it won't be fair on our part if when the Finnish companies come to invest, they are being hijacked by the big companies". The idea of help-from-abroad is cancerous and a lot needs to be done in order to make companies in developing economies start thinking more of partnership for business rather than partnership for help. One way to change this "foreign aid syndrome" is when the businesses are being presented to them by people they know and trust. CC Coop is an expert organization in helping Finnish RE companies in making these kinds of business presentations to African counterparts. With little training on company's specific product and sales information, CC Coop can be the mouth-piece of Finnish SMEs on African markets.

References

Beattie, A. C. 2013. Is the World Ready to Buy a Car Made in China? Advertising Age [referenced 28 October 2014]. Available on http://adage.com/article/global-news/world-ready-buy-a-car-made-china/241004/

Larossi, G., Mousley, P. & Radwan, I. 2009. Directions in Development: Assessment of the Investment Climate in Nigeria. Virginia: World Bank Publications.

Lewis, R. 2004. Finland, Cultural Lone Wolf. Boston: Nicholas Brealey.

Mlozi, S. 2013. International Business lecture series. HANKEN School of Economics.

National Technical Working Group 2009. Business Environment and Competitiveness: Nigeria Vision 2020 Program. Abuja: National Technical Working Group.

Osifo, C. O. 2012. The Effects of Ethical Governance on Public Trust. Acta Wasaensia 271. Public Management, University of Vaasa. Doctoral thesis.

Robinson, J. A. 2005. An economic sociology of entry barriers: Business entry and the inner city market. Management Division, Columbia University, Graduate School of Business. Doctoral thesis.

Statistics Finland 2012. Students and qualifications of educational institutions 2012. Helsinki: Statistics Finland.

Study Portals 2014. Study portals for Bachelors [referenced 28 October 2014]. Available on: http://www.bachelorsportal.eu/

University of Helsinki Career services 2014. International student's guide to working in Finland. Helsinki: University of Helsinki.

Wolff, R. D. 2012. Democracy at Work: A Cure for Capitalism. Chicago: Haymarket Books

Yleisradio 2013. Finland slips in corruption index. News 3.12.2013.

FUAS
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The FUAS federation – Federation of Universities of Applied Sciences – is a strategic alliance established by Häme, Lahti and Laurea Universitites of Applied Sciences

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Energy poverty presents a significant hurdle to achieving goals of improved health, prosperity and a liveable environment in many developing countries. While the main objective in the energy sector is to maintain or expand energy services, governments are also increasingly acknowledging the role of renewable energy in reducing health and environmental impacts related to the use of fossil fuels, as well as possibilities of creating jobs and reducing poverty through new sustainable energy solutions. Finnish companies have technologies and solutions that can make a difference, but entering new markets is a big challenge.

This publication presents some of the findings on creating and modelling networks to the developing renewable energy markets in Nigeria, Kenya and South Africa during the Connect project. The project is implemented by the Federation of Universities of Applied Sciences (FUAS), the alliance between Lahti University of Applied Sciences, Laurea University of Applied Sciences and HAMK University of Applied Sciences during 2012-2014. The project is funded by Tekes – The Finnish Funding Agency for Innovation.

Network creation and modelling has been tested through collaboration with universities, ministries, companies, NGOs and other organisations in target countries, in addition to active participation of Finnish companies and FUAS international students. International students can be a great asset to Finnish companies seeking to internationalise, while university collaboration provides opportunities for identifying needs, two-way knowledge transfer and capacity building, networking with local stakeholders, and co-creating locally adapted solutions.

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